UNESCO CANADA/MAB

AN ANNOTATED BIBLIOGRAPHY OF RESEARCH AT MONT ST. HILAIRE, QUEBEC

REPORT
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AN ANNOTATED BIBLIOGRAPHY OF RESEARCH AT MONT ST. HILAIRE, QUEBEC

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Views of Mont St. Hilaire

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Preface

Mont St. Hilaire, one of the Monteregian Hills located along the Richelieu River just south and east of Montreal, provides an excellent field research site close to the McGill campus in Montreal. In excess of 930 ha comprising the entire watershed of Lac Hertel and much of the outer flanks of the mountain are protected as a UNESCO Biosphere Reserve under the management of the Gault Estate Board of McGill University. The Research Centre building includes a wet chemistry lab, ample bench space for processing samples, offices and a conference room, and a connection to McGill's mainframe computer. The dormitories provide comfortable on-site living facilities for investigators. Over the years many investigators from McGill and other universities have carried out diverse research projects on the mountain. There is substantial background information on the natural history of the mountain and reference to it will help in the planning of new investigations. The purpose of this annotated bibliography is to provide a readily available summary of past research at Mont St. Hilaire as an aid to present and future investigators.

In preparing our annotations, we sometimes have left in material that reviewers would prefer to have deleted such as the list of 130 minerals reported on Mont St. Hilaire or the detailed soil analyses found in Beaumont (1980). The first is a concise summary useful to naturalists at the Mont St. Hilaire Nature Centre and also a detailed invitation to mineralogists in eastern North America to visit and possibly work at Mont St. Hilaire. Similarly Beaumont's data is the only available summary of soil characteristics on the mountain, and it unfortunately is not published in the open literature. Those interested in forest soils and acid rain effects can use these tables to immediately evaluate the possibility of using Mont St. Hilaire as a reference study site. Generally, we've tried to keep some of this type of detailed data in the bibliography so it's not only a summary of what's been done but to some degree also of what's been found.

The compilation of this bibliography was made possible through the diligent efforts of Mr. Adrian Levy who carried out the library research and drafted the project summaries. The effort of Dr. George Francis, Chairman of the Canada/MAB Working Group on Biosphere Reserves, in securing monies for salary, supply, and publication costs was equally essential. Cathy Hughes, Egidia De Michele, and Janet Zohorsky patiently typed and retyped the many drafts of the bibliography.

The present bibliography is complete through 1985 to the best of our knowledge. Despite our best efforts there are undoubtedly references to past work on Mont St. Hilaire that we have overlooked. I would appreciate hearing of these, and of any mistakes in the present summaries. We hope that a more complete record of earlier work along with publications from ongoing and future projects will lead to a supplement to this bibliography within a few years.

Finally, I will do my best to provide any additional information on Mont St. Hilaire to prospective investigators. This bibliography demonstrates the research potential of the Gault Estate Reserve, and I look forward to hearing of possible projects that will further extend our knowledge of the mountain.

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Introduction

When Andrew Hamilton Gault died in the fall of 1958, he bequeathed the mountain of St. Hilaire to McGill University. Previous to Gault's purchase of the property in 1912, it was used mainly as a tourist centre, with only some preliminary surveys conducted on the geological origins of the district. It was not until the management of the Gault Estate was passed over to McGill that scientific research began in earnest on the mountain. In the past quarter century some 50 graduate theses based on studies at Mont St. Hilaire have been produced, as well as over 150 publications in learned journals; these represent a very considerable contribution to knowledge of the mountain, the Monteregian Hills, and the eastern deciduous forest biome.

The first reference to Mont St. Hilaire in the scientific literature was in 1860, by Sterry Hunt, dealing with the igneous rocks on the mountain. At the beginning of the 20th century, Frank Dawson Adams identified Mont St. Hilaire as one of the Monteregian Hills (from Mons = Mount and Regius = Royal). In 1959, professors from McGill established a scientific survey to assess the research potential of the Gault Estate; included in this survey were itemized lists of the mountain's flora and fauna. These lists provided the basis for subsequent research into botany, zoology, limnology, and ecology on the mountain. Research on the geology, mineralogy, pedology, hydrology, meteorology, and palynology was initiated at this same time.

The 13 chapters of this bibliography reflect the primary areas of previous research on the mountain. Every attempt has been made to prepare a comprehensive list of references of Mont St. Hilaire, including work done at universities other than McGill. Though many of the references overlap into two or more categories, they are listed under the main topic of research.

Summaries include information relevant to Mont St. Hilaire; in particular, data indicating either the representational nature or the uniqueness of the mountain are included. The summaries were written from abstracts, author summaries, as well as the thesis or article itself. Every reference in the bibliography was read. Apparently conflicting data, like those for the maximum depth of Lac Hertel, are reported as given in each of the source references. Similarly we have given scientific names cited in the source without any attempt to correct to current nomenclature. Though every attempt was made to summarize each reference accurately, we strongly recommend that researchers using this bibliography examine the source documents for all critical references.

We have included a topographic map of the mountain and a map of the underlying geology to assist the reader in finding locations mentioned in the bibliography. Two maps of the underlying and surficial geology of the surrounding St. Lawrence Lowlands are given, as well as a series of five maps showing the pattern of European colonisation of the region immediately bordering the mountain, starting with the earliest settlements on the banks of the Richelieu River in 1761.

In 1960, Mont St. Hilaire was named by the Canadian government as a federal Migratory Bird Sanctuary to protect the more than 175 species of birds identified on the mountain. UNESCO designated the mountain as Canada's first Biosphere Reserve in 1978: these reserves are intended to "represent the world's major ecological systems with their different patterns of human use and adaptations to them." This recognition emphasizes Mont St. Hilaire's usefulness as both a natural area and a research centre. The unique characteristics of the mountain, including its great mineralogical, floral and faunal diversity, create a whole which is greater than the sum of its parts. That this uniqueness has been, and will continue to be, studied and appreciated agrees well with the wish of Andrew Hamilton Gault that the mountain of St. Hilaire be preserved "as a great heritage for the benefit and enjoyment of the youth of Canada."

HISTORY AND HUMAN USE

Ballabon, Maurice Bernard. 1952. A regional study of the Richelieu Valley - The Urban Centres, Department of Geography, McGill University, Montreal, Québec. 331 pages.

Although only limited information on Mont St. Hilaire itself is cited, this reference provides an excellent overview of the history of settlement of the mountain and its surroundings. Prior to 1761 the flanks of the mountain were essentially undisturbed with only sparse settlement along the west bank of the Richelieu River. Between 1761 and 1815 Beloeil and St. Hilaire developed as townsites; clearing began on the north and west flanks of the mountain. By 1840 St. Hilaire had some 15 sawmills, flour mills, grist mills, and fulling mills as well as a distillery, 3 tanneries, 2 forges, and a foundry. The woods around Mont St. Hilaire had been cleared to both the north and south. In 1851 the parish of Beloeil had 2250 inhabitants and that of St. Hilaire another 1520.

Cardinal, A. 1980. Histoire de Saint Hilaire: Les Seigneurs de Rouville, Les Editions du Jour, Montreal, Québec. 111 pages.

The history of Rouville County, including Mont St. Hilaire, is given from the time of the first Europeans.

Cobban, Aileen A. 1952. The evolution of land use in the Richelieu Valley. M.A. Thesis, Department of Geography, McGill University, Montreal, Québec. 93 pages.

This thesis draws on the same primary sources as Lithgow (1952), but discusses settlement patterns from an agricultural rather than urban viewpoint; emphasis is on the edaphic basis of land clearing and the subsequent cropping patterns. The sandy soils north of Mont St. Hilaire delayed clearing in that area until the 19th Century. In the period 1760-1815, the mountain and its immediate surroundings were undisturbed forest with only a bit of clearing along the Rivière des Hurons. By 1839 settlement along the Rivière des Hurons was well-established and clearing at Beloeil extended 6 km back from the river. Wheat was the dominant commercial crop, although the Hessian fly and wheat midge were serious pests. Between 1839 and 1867 the landscape viewed from atop Mont St. Hilaire had shifted from forest with isolated clearings and settlements to an agricultural plain dotted with remnant woodlands. The Verchères sand plain and the sand plain north of Mont St. Hilaire remained uncleared as did the mountain itself. Oats and barley replaced wheat as the dominant grain crops.

Duffy, Helen. 1978. Leduc's history of Mont Saint Hilaire. Arts Canada, October/November 1978: 16.

Lacroix, Laurier. 1978. The dream mountain of Ozias Leduc. Arts Canada, October/November 1978: 9-15.

Lithgow, Robert M. 1952. Land settlement in the Richelieu Valley. M.A. Thesis, Department of Geography, McGill University, Montreal, Québec. 123 pages.

When Champlain traversed the Richelieu River in 1609, he noted that its banks were entirely forested and without permanent settlement because of the river's use as a transportation corridor by warring Indian tribes. Only with the arrival of the Carignan-Salières regiment of 1200 soldiers in 1665 did the Richelieu Valley begin to be settled. Even then the Iroquois war of 1682 was a serious setback to settlement; only in 1701 was a permanent peace with the Iroquois achieved. By 1815 the forests at Mont St. Hilaire were among the few virgin tracts remaining in the Richelieu Valley. Mention is made of sugaring in maple stands on Mont St. Hilaire circa 1867 and of extensive apple orchards on gravel terraces around the mountain's base. The natural forests of Mont St. Hilaire remained largely uncut.

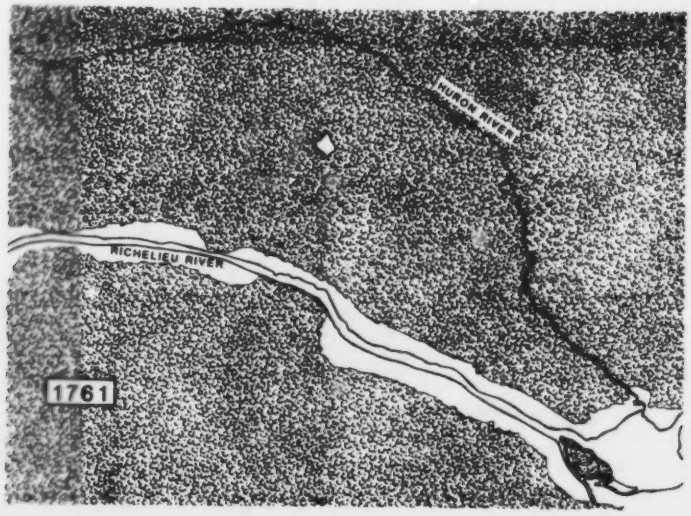
Lundgren, Jan. 1984. Mont St. Hilaire - a recreational resource and its use. Park News 20: 7-10.

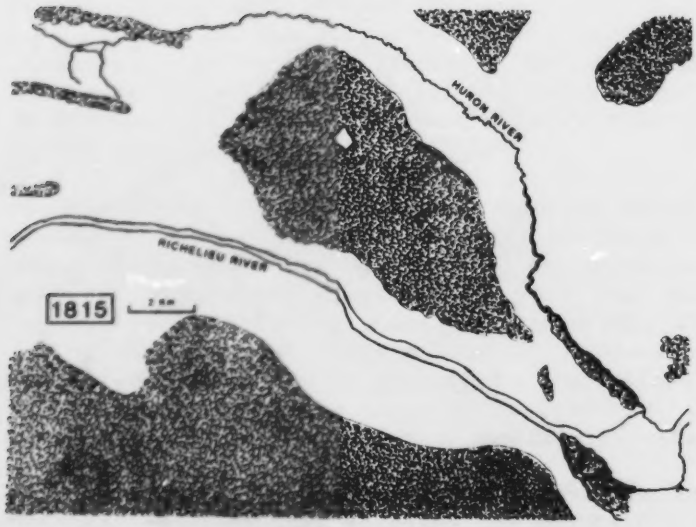
The over 80,000 visitors to the mountain in 1981 were concentrated during the spring (apple blossom time) and during the fall (autumn colours). With an average monthly visitor total of 6,800, the months of May, September, and October accounted for half of the annual volume. The 5 months with above-average monthly volumes account for 70.4% of visitor flow. In fact, as opposed to a typical park, visitor flow actually decreased in the summer: visitor flow in August was only a few hundred persons above the November figure, which in turn is only 50% of the annual monthly average.

A survey was conducted between 1978-1980 in order to establish types of visitor behaviour. A striking feature was the strong spatial concentration of visitor movements in a small percentage of the park's trail system: of the 36 possible trail links on the mountain, only one-third are intensely utilized. Three-quarters of all traffic was carried by 11 links in May, and by 13 in October. This heavy use was concentrated on the trails from the Nature Centre to the peak of Pain du Sucre via the shore of Lac Hertel. The remainder of the trail system had very little visitor traffic.

Manus, R.A. 1979. The effectiveness of slide-tape preparation for nature education field trips. M.A. Thesis, Department of Education, Concordia University, Montreal, Québec. 191 pages.

An audio-visual programme, prepared by one of the Nature Centre naturalists, was shown to 5th grade students visiting the mountain. Students seeing the programme performed better on tests that assessed the students' knowledge of nature interpretation. A copy of the slide-tape programme is in the Concordia University Library.





Approximate forest cover and settlement pattern surrounding Mont St. Hilaire in 1761, 1815, 1867, 1914, and 1945. Redrawn from Cobban (1952) and Lithgow (1952). The mountain surrounds Lac Hertel in the upper center of each figure.

HURON RIVER
RICHELIEU RIVER
1867
2 Km
HURON RIVER
RICHELIEU RIVER
1914
2 Km
HURON RIVER
RICHELIEU RIVER
1945
2 Km

Marsh, John, and Susan Dickey. 1984. Mont St. Hilaire: a history. Park News 19(4): 9-14.

Mont St. Hilaire, 35 km east of Montreal, is one of the Monteregian Hills, igneous intrusions that welled up through the St. Lawrence Lowlands approximately 100 million years ago. Over 120 varieties of minerals have been identified on Mont St. Hilaire thus putting the mountain among the top ten areas of the world in terms of diversity of local mineral varieties. Over 600 species of vascular plants have been identified on the mountain, including 30 species of trees in the forests which cover 95% of the area. About 80 species of birds nest on the mountain, and some 100 others have been observed.

Historically, Mont St. Hilaire was located between the Iroquois territory to the west and south-west, and the Algonkian territory to the south and east; accordingly it was occupied by each group at different times. At the time of European settlement, the Abenaki tribe of Algonkian Indians lived in the area. The Indians were displaced in the 1600s as the French imposed a seigneurial regime on the area and settlement by colonists began. In 1694, the seignory of Rouville was handed over to Jean-Baptiste Hertel. For the next 150 years the seignory remained in the Hertel family and while settlement progressed along the river, the mountain itself remained quite wild.

In 1844 the seignory, including Mont St. Hilaire, was sold by J.B. René Hertel to Major Thomas Edmund Campbell, who intended to develop the estate and exploit the tourist potential. During the 1840s, an oratory and cross were built on the highest peak, Pain du Sucre; the cross was destroyed during the 1850s and the chapel was burned to the ground some 30 years later. In 1851, a small hotel was built near Lac Hertel but burned to the ground 10 years later. Despite the lack of lodging facilities on the mountain, access was greatly improved with the completion of the Grand Trunk Railway and a road around the mountain. Upon Major Campbell's death in 1872, the estate was passed to his son Charles, who soon sold it to his five brothers. The northern flanks of the mountain were sold; but one of the brothers, Bruce Campbell, built the Hotel Iroquois in 1874, near the present Nature Centre. Though a very popular tourist spot, the Hotel Iroquois burned down in 1895.

In 1913, the mountain was sold to Brigadier Andrew Hamilton Gault; Gault used the mountain for the next 45 years as a summer retreat, although still allowing the public access to the mountain. The completion in 1941 of the Sir Wilfred Laurier bridge over the Richelieu River allowed much improved access to the mountain, increasing its popularity. In the late 1950s Gault started construction of a stone manor on the shores of Lac Hertel; though he saw it through to completion, he did not benefit from it, for he died three weeks later on November 28, 1958. Upon his death, Gault bequeathed the 925 hectare Mont St. Hilaire estate to McGill University.

Scientific research began in earnest on the mountain, starting with a scientific survey that assessed the mountain's research potential. In 1963

a scientific centre was established, as well as dormitory facilities. In 1968, the property was divided into two zones, the east side of the mountain to be used for research, and the west side to be used by the public and for nature interpretation. In 1970, the Mont St. Hilaire Nature Conservation Centre was established; nature interpreters were hired, and the Centre quickly became popular with school groups.

The Canadian government named Mont St. Hilaire a federal Migratory Bird Sanctuary in 1960. In 1978 the mountain was designated Canada's first Biosphere Reserve. Such reserves are internationally selected and recognized through the UNESCO Man and the Biosphere Programme. Over 90,000 people visit the mountain every year. Field courses are given under the auspices of McGill University and other Canadian universities. Research continues to be conducted in zoology, botany, ecology, geology, and meteorology.

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* PALYNOLOGY *
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Clark, R.H. 1955. St. Jean-Beloeil Area. Geological Report 66, Québec Mines Department, Geological Surveys Branch, Queen's Printer, Québec. 83 pages.

Most fossil beds on Mont St. Hilaire, primarily between the mountain and the Richelieu River, show that the stratigraphy is predominantly of the Lorraine group, with some Richmond affinities. The fauna of these beds consists of the following species: Cornulites sp., Cyrtolites ornatus, Lophospira sp., L. tropidophora, Cuneamya scapha brevior, Ctenodonta borealis, Clidophorus praevolutus, C. poststriatum, Ischyrodonta sp., Whitella sp., W. huguesensis, Pterinea sp., Byssonychia radiata, Byssonychia sp. cf. B. richmondensis, Cymatonota pholadis, Modiolopsis concentrica chambliensis, Psiloconcha sinuata borealis, Pholadomorpha divaricata, and Eusarcus sp. A short summary of the igneous rocks on Mont St. Hilaire is also given, as well as the manner of intrusion of Mont St. Hilaire and the other Monteregian Hills.

Elson, J.A. 1969. Radiocarbon dates, Mya arenaria phase of the Champlain Sea. Canadian Journal of Earth Science 6: 367-372.

The history of the Champlain Sea is divided into an early cold period of subarctic water termed the Hiatella phase that lasted from its inception, about 11,800 years ago (Two Creeks time), until a low water phase about 10,800 years ago (Younger Dryas or Valders time). This was followed by an interval of warmer boreal water, here called the Mya arenaria phase, that lasted from about 10,800 years until 10,200 years ago or the end of the Champlain Sea. General descriptions of Groningen dates GrN 2031 (10,870 ± 100 B.P.), GrN 2032 (10,450 ± 80 B.P.), GrN 2034 (10,590 ± 100 B.P.), and

GrN 2035 (10,330 ± 100 B.P.) are presented. These dates record the Mya arenaria phase of the Champlain Sea, which may have had an initial rising (transgressive) phase, though the stratigraphic evidence, supported by three sets of radiocarbon dates, is not wholly conclusive.

Foerste, A.F. 1916. Upper Ordovician formations in Ontario and Quebec. Geological Survey of Canada Memoir 83. 279 pages.

Lasalle, P. 1966. Late quaternary vegetation and glacial history in the St. Lawrence Lowlands, Québec. Leidse Geologische Mededelingen 38: 91-128.

At the end of the last ice age, parts of the St. Lawrence Lowlands, including Mont St. Hilaire, were deglaciated earlier than others because of their elevation. Glacial lakes existed for some time in the ice around the mountain. The Champlain Sea episode began as the marine waters from the east proceeded to invade the fresh waters from the western part of the St. Lawrence Lowlands; Mont St. Hilaire was free of ice at this time, circa 11,400 years before present. The large body of gravel and sand south of St. Hilaire may have been in part outwash deposited in a glacial lake south of the mountain (or ice contact drift), before being reworked by the waters of the Champlain Sea.

Pollen and diatom analyses of a core taken from the "Hemlock Bog" on the eastern flank of East Hill indicate that this area was an oligotrophic lake with open waters during the marine invasion; it is possible that this lake was not filled with marine or brackish waters.

Diatom analyses of a core taken from Lac Hertel indicate that the upper level of the Champlain Sea was about 170 m above present sea level. Lac Hertel, with a base level of 173 m, showed only slight contamination of marine and brackish diatoms at the bottom of the core. The lake was deeper and clearer than today, and the waters were cooler. With sedimentation and the input of nutrients, the lake has become more mesotrophic.

The early post-glacial vegetation of the St. Lawrence Lowlands, including Mont St. Hilaire, was an open one, with an abundance of heliophilous herbs and shrubs together with Picea (spruce) stands. The next trees to reinvade were of the genus Betula (birch), followed by Pinus (pine). Thermophilous trees including Quercus (oak), Fagus (beech), Tsuga (hemlock), Tilia (basswood), and Acer (maple) arrived subsequently.

Terasmae, J., and P. Lasalle. 1968. Notes on late-glacial palynology and geochronology at St. Hilaire, Quebec. Canadian Journal of Earth Science 5: 249-257.

Cores taken in the St. Hilaire bog and Lac Hertel subsequent to Lasalle (1966) re-evaluate the late-glacial palynology of the St. Lawrence

Lowlands. The bog is at 243 m above sea level in an elongated bedrock depression. The north and south slopes of the depression are steep, almost bare rock, whereas the ends and deeper parts are covered with glacial deposits. The present vegetation is seasonally wet, tree-covered swamp with abundant ferns. A small stream drains this swampy peatland at its eastern end. The bog's stratigraphy comprises 5 m of bog peat, which overlies about 3 m of organic lacustrine sediments, at least 1 m of inorganic lacustrine sediments, and an unknown thickness of glacial deposits. The basal sediments cored in the bog are more than 12,580 ± 220 years old.

Lac Hertel, at 173 m above sea level, lies in a bedrock depression enclosed by steeply sloping hills on the north, east, and south. These bedrock hills are separated by narrow valleys, which contain surficial deposits: a valley opens from the lake to the southwest and is followed by the outlet stream. The lake basin has been partly filled with surficial deposits, which form the shoreline around most of the lake. The lake slopes gently into the basin, except in the southern part where the slope is steep. The deepest part of the lake, about 7.6 m, forms an oblong enclosed basin close to the southern shore.

The pollen records taken from the cores indicate the following late-glacial climatic fluctations: 1) an initial cool episode with a northern boreal climate at something more than 12,500 years B.P., during which the ice sheet had thinned sufficiently to expose the Monteregian Hills as islands or nunataks above the surface of the glacier, 2) then a warming trend, followed by 3) another cold episode approximately 11,000 years ago. The authors suggest that ice retreat was contemporaneous with the expansion of ice-dammed lakes in the St. Lawrence Lowlands prior to innundation by the Champlain Sea.

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* **FLORAS AND FAUNAS** *
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Bouchard, A., D. Barabé, M. Dumais, and S. Hay. 1983. The rare vascular plants of Quebec. Syllogeus No. 48. National Museum of Natural Sciences, National Museums of Canada, Ottawa. 75 pages.

The following rare and endangered plant species are reported on Mont St. Hilaire (see Maycock 1961; Mauffette 1981): Acer nigrum, Adlumia fungosa, Arabis drummondii, Arabis laevigata, Asclepias exaltata, Athyrium pycnocarpon, Botrychium lanceolatum, Cardamine parviflora, Carex hitchcockiana, C. platyphylla, C. prasina, C. radiata, Claytonia virginica, Cystopteris fragilis var. laurentiana, Galium circaezans, Habenaria orbiculata, Hamamelis virginiana, Hieracium paniculatum, Lysimachia hybrida, Orchis spectabilis, Pedicularis canadensis, Schizachne purpurascens, Sparganium androcladum, Viola pubescens var. pubescens, and Waldsteinia fragarioides.

Croteau, M., and D. Roby. 1982. Bird Check-List (at Mont St. Hilaire). Centre de conservation de la Nature, Mont St. Hilaire, Québec. 26 pages.

Since the beginning of the 20th century up to 134 species of birds have been observed regularly on Mont St. Hilaire during the spring, 101 in summer, 136 in autumn, and 37 in winter. Another 46 species of birds have been observed on the mountain, but are not common; 83 species nest on the mountain.

Denman, N.S., and I.S. Lapper. 1964. The herpetology of Mont St. Hilaire, Rouville County, Québec, Canada. Herpetologica 20: 25-30.

This study, based on museum collections and field identifications, reports the amphibians and reptiles of the mountain. It supersedes Lapper (1961) which contained erroneous information. The amphibians on Mont St. Hilaire are: Ambystoma maculatum, Plethodon cinereus cinereus, Diemctylus viridescens viridescens, Desmognathus fuscus fuscus, (this species is interesting because it is not found in the lowlands surrounding Mont St. Hilaire), Bufo americanus americanus, Hyla crucifer crucifer, Hyla versicolor versicolor, Rana catesbeiana, Rana clamitans melanota, Rana septentrionalis, Rana sylvatica, Rana pipiens, Rana palustris and Pseudacris triseriata triseriata.

The reptiles found on the mountain include the following: Chelydra serpentina, Clemmys insculpta, Diadophis punctatus edwardsi, Lampropeltis triangulum, Storeria occipitomaculata occipitomaculata, Thamnophis sirtalis (either T.s. sirtalis or T.s. palidula).

Other species thought to occur are Hemidactylium scutatum and Ambystoma laterale. Species notably absent include: Chrysemys picta marginata, Emys blandingi, Graptemys geographica, Trionyx spinifer spinifer, Storeria dekayi dekayi, Opheodrys vernalis vernalis and Natrix sipedon sipedon. The record of Eurycea bislineata in the original paper is erroneous (Denman, personal communication).

Dupret, H. 1934. Etudes sur les mousses de la région de Montréal. Contribution Laboratoire Botanique Université de Montréal 25: 1-70.

This study records 21 species of mosses and hepatics found on Mont St. Hilaire: Blindia acuta, Didynodon rubellus, Grimmia apocarpa, Rhacomitrium aciculare, Bryum capillare, Mnium cinclidioides, Drummondia clavellata, Fontinalis antipyretica, Thamnium alleghaniense, Haplocladium microphyllum, Drepanocladus aduncus, Hygrohypnum ochraceum, H. dilatatum, Bryhnia novae-angliae, Eurhynchium strigosum, Brotherella recurvans, Pylaisiapolyantha, Isopterygium elegans, Rhytidium rugosum.

Finnamore, A.T. 1979. The sphecid wasps of southern Quebec (Hymenoptera:Sphecidae). M.Sc. Thesis, Department of Entomology, Macdonald Campus, McGill University, Montreal, Québec. 532 pages.

The predaceous solitary wasps in the family Sphecidae comprise a relatively large and economically important group. This study lists 155 species, of which 76 are known to occur on Mont St. Hilaire; the subfamilies and tribes found in Québec and on Mont St. Hilaire are given in the table below. Four new species in the genus Mimesa were identified at Mont St. Hilaire: M. foxi, M. huron, M. iroquois and M. mallochi.

Subfamily	Tribe	# Species in Québec	# Species known on Mont St. Hilaire
Sphecinae	Scleiphrini	2	2
	Sphecini	4	1
	Ammophilini	12	5
Pemphredoninae	Psenini	18	12
	Pemphredonini	12	5
Astatinae	Astatini	4	0
Larrinae	Larrini	9	4
	Miscophini	3	1
	Trypoxylini	4	3
Crabroninae	Oxybelini	6	2
	Crabronini	44	23
Nyssoninae	Mellinini	1	0
	Alyssonini	6	2
	Nyssonini	3	1
	Gorytini	9	6
	Bembicini	3	2
Philanthinae	Philanthini	6	3
	Aphilanthopini	1	1
	Cercerini	8	3
	Total	155	76

Lapper, I.S. 1961. Survey of reptiles and amphibians on Mont St. Hilaire. Bulletin Philadelphia Herpetological Society 9(6): 19.

Marie-Victorin, Frère. 1913. Aperçus sur la flore de la Montagne de Saint Hilaire. Bulletin Société Géographique Québec 7: 163-168.

Maycock, Paul F. 1961. Botanical studies on Mont St. Hilaire, Rouville County, Québec. Canadian Journal of Botany 39: 1293-1325.

This comprehensive floristic survey of Mont St. Hilaire includes a general introduction to the topographic features, geology, soils, climate, and vegetation. In all, there are a total of 526 different species, 22 varieties, and 3 forms or a total of 551 different taxa. Of these 551 taxa, 34 are trees, 65 are shrubs, 6 are lianas, and 421 are herbs. Twenty-three species are more or less restricted to aquatic environments or are only found on land because of fluctuations in water level.

The plants are in 88 different families: 9 families of fern-allies, ferns, and conifers, 14 of monecotyledons and 65 of dicotyledons. The largest family represented is the Compositae (11% - 58 spp.), followed by Rosacae (7% - 38 spp.), Cyperaceae (7% - 39 spp.), Graminae (7% - 37 spp.), Ranunculaceae (3% - 19 spp.) and Liliacae (3% - 18 spp.). The ferns, including members of three families, number 30 species (6% of flora). The number of introduced species on the mountain is 57, or 11% of the total flora. Short notes are included with the species list concerning general habitat, moisture conditions of the site, exposure, and other relevant information, particularly the community or vegetation type of optimum occurrence.

Mont St. Hilaire occupies a central location between the Northern Conifer-Hardwood/Northern Conifer regions of eastern North America and the Boreal Forest further north. Because of this, its flora is diverse and comparatively rich. Species that are distributed further south and which are on the northern edge of their range include: Hamamelis virginiana, Staphylea trifolia, Phegopteris hexagonoptera, Athyrium pycnocarpon, Prunus serotina and Vaccinium corymbosum. Species which occur most frequently in boreal forest communities and which are approaching their southern lowland limits in southern Québec include: Linnaea borealis, Clintonia borealis, Cornus canadensis, Taxus canadensis, Potentilla tridentata, Draba arabisans and Pyrola asarifolia.

Ouellet, Henri R. 1967. Birds of the Monteregian Hills and adjacent areas, Province of Québec, Canada. M.Sc. Thesis, Department of Zoology, McGill University, Montreal, Québec. 339 pages.

This thesis first details the present vegetation of the Monteregian Hills and associated lowlands, as well as listing vegetation known or assumed to exist before the colonization of Québec by Europeans. The bird fauna of the primeval forest was characterized by species of the deciduous forest. The size and abundance of coniferous stands was proportionately greater in the primeval forest than it is at present, and the numbers of birds of the coniferous forest were consequently greater then. With the arrival of the white man, the forested areas of the region were reduced by 72%, and the coniferous stands have almost completely disappeared. At least 11 species of birds have disappeared as a result of deforestation and human activity. Deforestation, on the other hand, has been beneficial to species

of open areas and accounts for the appearance of several new species. Some 288 species occur in the region: 176 species of land birds, 63 species of water birds, and 49 species of marsh birds. Of these, only 155 species breed in the region: 122 species of land birds, 19 species of water birds, and 14 species of marsh birds.

Ouellet, Henri R. 1974. Les oiseaux des collines montérégiennes et de la région de Montréal, Québec, Canada. Publications in Zoology, No. 5 - National Museums of Canada, Ottawa. 167 pages.

Ouellet, Jeannine. 1965. La végétation bryologique du Mont Saint Hilaire, Compté de Rouville, Québec. M.Sc. Thesis, Pure and Applied Sciences, University of Ottawa, Ottawa, Ontario. 197 pages.

The habitats and associations of the 197 moss species (80 genera) and 36 hepatics (27 genera) found on Mont St. Hilaire are reported in detail. The moss genera with the most species on the mountain are Brachythecium (13 species), Mnium (12), Plagiothecium (12), Fissidens (7), Dicranum (7), Bryum (6), Sphagnum (6), and Thuidium (6). The comparable hepatic genera are Calypogeia (3), Cephalozia (2), Jungermannia (2), Lophocolea (2), Porella (2), and Ptilidium (2).

Ouellet, J., and F. LeBlanc. 1967. La flore et la végétation bryologique du Mont St. Hilaire, Compté de Rouville, Québec. Canadian Journal of Botany 45: 803-831.

A list of 248 hepatic and moss taxa found on Mont St. Hilaire is given in conjunction with a detailed tabulation of their habitat distribution and ecological associations. Based on Ouellet (1965).

Rousseau, C. 1974. Géographie floristique du Québec/Labrador. Distribution des principales espèces vasculaires. Les Presses de l'Université Laval, Québec. 799 pages.

Todd, J.H. 1963. A survey of the trematode parasites of fishes from Lake Hertel, Mont St. Hilaire, Québec. M.Sc. Thesis, Department of Parasitology, Macdonald College, McGill University, Montreal, Québec. 55 pages.

The trematode parasites of fishes from Lac Hertel include: Azygia longa, Bunodera luciopercae, Crepielostum cooperi, Octomacrum lanceatum, Phyllodistonum candatum, Phyllodistonum folium, Posthodiplostum minimum, Tetraonchus monenteron, Uvulifer ambloplitis. This study also presents data on the seasonal variation of host infection, and the % infection on different fish species.

Winn, Albert F. 1912. A preliminary list of the insects of the Province of Quebec. Part 1 - lepidoptera. Quebec Society for the Protection of Plants, Supplement 1912.

Four hundred and sixty-four species of Lepidopterans, in the following 32 families, were recorded on Mont St. Hilaire: Agarastidae-1, Arctiidae-9, Cossidae-1, Drepanidae-1, Gelechiidae-3, Geometridae-95, Hesperiidae-8, Hypenidae-14, Lasiocampidae-3, Limacodidae-8, Liparidae-3, Lithosiidae-1, Lycaenidae-5, Noctuidae-141, Nolidae-1, Notodontidae-10, Nymphalidae-5, Oecophoridae-5, Pantheidae-1, Papilionidae-2, Pieridae-2, Pterophoridae-6, Pyralidae-60, Saturniidae-5, Satyridae-1, Sphingidae-10, Stenometidae-1, Syntomidae-3, Thyatiridae-1, Thyridae-1, Tineidae-4, Thyridae-1.

Wrigley, Robert E. 1967. The mammals of southwestern Québec (south of the St. Lawrence River). M.Sc. Thesis, Department of Zoology, McGill University. 313 pages.

Specimens collected on Mont St. Hilaire include: Sorex fumeus, Blarina brevicauda, Myotis lucifugus, Lasionycteris noctivagans, Eptesicus fuscus, Sciurus carolinensis, Tamiasciurus hudsonicus, Marmota monax, Tamias striatus, Peromyscus maniculatus, Peromyscus leucopus, Clethronomys gapperi, Microtus pennsylvanicus, Microtus pinetorum, Napaeozapus insignis, Erethizon dorsatum, Vulpes vulpes, Mustela erminea, Mustela frenata. Other mammals now known to occur on the mountain include: Procyon lotor, Mephitis mephitis, and Odocoileus virginianus.

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* **BOTANY** *
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Cinq-Mars, L. 1966. Mise au point sur les violettes (Viola spp.) du Québec. Naturaliste Canadien 93: 895-958.

MacDonald, Alistair David. 1971. Floral development in the 'Amentiferae'. Ph.D. Thesis, Department of Biology, McGill University, Montreal, Québec. 172 pages.

Collections of Myrica gale, Populus tremuloides, Salix sp., Alnus rugosa, Betula alleghaniensis, B. populifolia, Corylus cornuta, Ostrya virginiana, Laportea canadensis, Fagus grandifolia and Quercus rubra were made at Mont St. Hilaire during 1966-1968. The ontogeny of the male and female flowers of these species is examined in detail.

Raymond, M. 1950. Esquisse phytogéographique du Québec. Mémoire Montréal Jardin Botanique 5: 1-147.

Russell, Alina E. 1976. Biosystematics of the genus Impatiens in northeastern North America. M.Sc. Thesis, Department of Plant Science, Macdonald College, McGill University, Montreal, Québec. 239 pages.

This thesis draws on two collections from Mont St. Hilaire and presents a useful biosystematic overview of Impatiens pallida and I. capensis, the two touch-me-not species that are widespread on the mountain.

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* PLANT ECOLOGY *
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Beaumont, Jean-Pierre. 1980. Etude de quelques composantes écologiques de stations à Monotropa uniflora L. au Mont Saint-Hilaire et à l'Arboretum Morgan, Québec. M.Sc. Thesis, Department of Renewable Resources, Macdonald College, McGill University, 120 pp.

Monotropa uniflora abundance was censussed at seven sites on Mont St. Hilaire. Three sites (11, 12, 13) were on the terrace between Lac Hertel and the north slope of Lake Hill, one (15) in the mature forest northeast of the Nature Centre, and three (14, 16, 17) in the disturbed forests north of the Nature Centre but southwest of the base of the (orange) trail to the old orchard. The vegetation and soil at each site were sampled in detail; these data are included in their entirety as appendices.

Table 1. Forest characteristics at the 7 Monotropa study sites.

Site	% Frequency - trees	Basal area trees: m^2/ha	Monotropa clumps/ha 1974	1975
11	13% Fagus grandifolia, 5% Pinus strobus, 3% Betula lutea, 3% Acer saccharum	74	108	0
12	18% F. grandifolia, 5% A. saccharum, 3% Acer pensylvanicum	13	647	324
13	28% F. grandifolia, 5% A. saccharum, 5% B. lutea, 3% Tsuga canadensis	58	431	216
14	15% A. saccharum, 8% F. grandifolia, 5% Fraxinus americana, 3% Ostrya virginiana, 3% Quercus rubra	5	9275	9814
15	15% A. saccharum, 30% F. grandifolia, 3% Q. rubra	64	-	863
16	53% O. virginiana, 10% A. saccharum, 3% Pinus strobus, 3% Q. rubra	15	-	4638

Site	% Frequency - trees	Basal area trees: m^2/ha	Monotropa clumps/ha 1974	1975
17	10% A. saccharum, 13% F. grandifolia, 3% Populus grandidentata, 3% Betula papyrifera, 3% Tilia americana	42	431	-

Table 2. Physical and chemical characteristics of the soils at the 7 Monotropa sites.

Site	Soil Horizon	Soil Resistance (kg/m^2)	pH	% stone	% organic matter	% sand	% loam	% clay
11	Ah	14	4.3	6	16	73	20	7
	Bfh^1	17	4.7	21	9	73	20	7
	Bfh^2	25+	4.9	26	8	79	14	7
12	Ah	8	4.5	23	20	73	18	9
	Bhf	20	4.7	23	13	80	16	4
	Bfh^1	13	5.0	44	8	87	8	5
	Bfh^2	15	5.1	37	8	90	7	3
	BC	9	5.3	13	3	90	6	4
13	Ah	15	4.7	11	7	70	18	12
	Bf	36	5.1	18	3	81	10	9
	BC	13+	5.2	14	1	82	12	6
14	Ah	10	4.6	9	24	60	32	8
	Bhfj	10	4.6	30	17	63	30	7
	BC	31+	4.7	21	15	60	33	7
15	Bh	8	3.2	13	40	-	-	-
	Bhf	10	4.2	29	14	51	39	10
	Bfh	37	4.8	69	7	69	24	7
	BC	10+	4.8	62	5	76	18	6
16	Ah	5	4.1	2	17	64	29	7
	Bhf	22	4.7	16	7	73	21	6
	BC	28+	5.0	22	4	79	21	0
17	Ah	13	5.1	37	22	68	22	10
	Bhfj	10	5.0	46	9	70	24	6
	Bf	37+	5.0	65	4	72	20	8

Table 3. Nutritional characteristics of the soils at the 7 Monotropa sites.

Site	Soil Horizon	$N-NH_4$ (kg/ha)	$N-NO_3$ (kg/ha)	P (kg/ha)	K (kg/ha)	Ca (kg/ha)	Mg (kg/ha)
11	Ah	14	5	44	147	1390	79
	Bfh^1	2	4	41	46	220	18
	Bfh^2	2	4	59	40	341	20
12	Ah	27	10	64	136	495	53
	Bhf	5	7	33	33	231	18
	Bfh^1	4	6	42	18	220	11
	Bfh^2	6	7	44	13	205	9
	BC	5	4	139	13	176	9
13	Ah	8	5	37	64	1600	79
	Bf	2	5	31	70	744	35
	BC	3	4	48	770	44	
14	Ah	14	9	66	132	1247	75
	Bhfj	9	5	79	62	275	24
	BC	5	6	53	29	220	18
15	Bh	13	7	253	229	1010	165
	Bhf	5	9	154	40	26	20
	Bfh	5	6	213	24	165	15
	BC	5	6	266	24	194	18
16	Ah	28	13	165	194	1130	103
	Bhf	5	7	370	24	220	13
	BC	8	5	482	20	220	18
17	Ah	12	4	187	517	4520	403
	Bhfj	7	6	95	53	909	57
	Bf	3	4	194	59	359	15

Bell, G., L. Lefebvre, L.-A. Giraldeau, and D. Weary. 1984. Partial preference of insects for the male flowers of an annual herb. Oecologia (Berlin) 64: 287-294.

The flowers of the annual herb Impatiens capensis have distinct male and female phases. The male phase lasts four times as long as the female phase, and male flowers contain about 50% more nectar than female flowers. This suggests that the bulk of allocation to the flower is designed to ensure the dispersal of pollen rather than the fertilization of ovules. Honeybees, wasps, and bumble bees all land on flowers more often than would be expected by chance, and, having landed, wasps and bumble bees are more likely to enter a male flower than a female flower. The frequency of male flowers in the diet therefore exceeds their frequency in the population. This preference, although strong and consistent, is only partial, since some

female flowers are included in the diet. We propose two hypotheses to account for the observed partial preference, the first based on competition between bees for flowers, and the second asserting that the bees detect nectar levels directly without using floral gender as a cue. The results of an experiment in which the most obvious gender cue, the androecium, was removed are consistent with the second hypothesis.

Bell, G. 1985. On the function of flowers. Proceedings Royal Society London B224: 223-265.

Experiments carried out on Mont St. Hilaire with Fragaria virginiana, Chrysanthemum leucanthemum, Impatiens capensis, Asclepias syriaca, and Viburnum alnifolium demonstrate that perfect (hermaphroditic) flowers function primarily as male organs.

Bouchard, A., and P.F. Maycock. 1970. A phytogeographical and phytosociological study of Viola rotundifolia in eastern Canada. Canadian Journal of Botany 48: 2285-2303.

Cook, Bryan D. 1971. Tree age distributions in a northern hardwood forest. M.Sc. Thesis, Department of Geography, McGill University, Montreal, Québec. 194 pages.

A main purpose of this study was to describe the nature and distribution of tree and seedling age structures of Fagus grandifolia (beech) and Acer saccharum (sugar maple). Sampling was done on North Hill, East Hill and Lake Hill; disturbance by fire, logging, or selective cutting has probably been absent for at least the past 100 years at these sampling sites.

There were large numbers of young sugar maple (up to 30 years old) on hilltops, with individual trees rarely exceeding 140 years of age - thus on hilltops conditions are apparently favourable for seedling and sapling survival, but not for survival into old age. Sugar maple is much more common than beech on hilltops. Though less strongly marked than on hilltops, trees between 0-30 years still predominate on sideslopes compared with older trees. The number of understorey young trees is smaller on sideslopes than on hilltops. Valley bottoms show no marked grouping of trees between 0-30 years. There is a more even distribution of middle aged (40-140 years) beech trees than sugar maples, a pattern which is similar to that for hilltops and sideslopes. There are smaller total numbers of beech and sugar maple growing in the valley bottom than on hilltops and sideslopes. Both species are generally intolerant of very poorly drained soil conditions, beech being less tolerant than sugar maple. The oldest tree found in this sample was a sugar maple 407 years old (in 1971) on a drier area in the East Bay valley bottom. The age distributions within the three topographic units of hilltops, sideslopes and valley bottoms are markedly different, indicating different growth conditions and processes of

regeneration and death operating on different land forms. There is a difference in age structures between species: beech, except on hilltops, does not live as long as sugar maple, but it tends to produce a more pronounced middle aged population on all land forms.

Holland, Peter G. 1971. Seasonal changes in forest plant patterns of deciduous forests in southern Québec, Canada. Oikos 22: 137-148.

Two stands were chosen to compare species numbers through the growing season. Stand 1 contained considerable land form diversity, including a steep (17-35°) back slope covered by rubble and gravelly soil over fractured basaltic rock, a side slope angling 4-6° down from the back slope to a swamp on the edge of Lac Hertel which is underlain by well drained gravelly till; a valley between the side slopes with a stream running down its centre; and a swamp at the base of the stream. Stand 2 was on more homogeneous terrain, containing a predominantly steep slope (15-40%); an extensive gently sloping convex crest underlain by a basaltic sill; and a depression and associated low ridge underlain by fine-grained calcareous till. The second stand lacks a stream course, areas underlain by till, swamp, blowdown mounds of any size or extensive rubble littered slopes. Both stand tree canopies were predominantly beech-maple.

Stand 1 contained the following number of species of plants during the 1969 growing season: May - 77 species, June - 83, July - 81, August - 84, September - 85, October - 48, November - 32. Stand 2 contained the following numbers of plant species during the same year: June - 52 species, July - 55, August - 58, September - 58, October - 43.

In Stand 1 the ecological correlations found suggest that the seasonal dynamics of plant patterns are a function of rock type, of duration and persistence of base flow in the streams, soil type, the nature of the seed bed, and the stability of the slopes. Though there is a seasonal change in its flora, in Stand 2, species number is fairly constant throughout the growing season. Areas exhibiting greater variation in plant patterns also exhibited the greater variation in seasonal hydrology.

Holland, Peter G. 1971. Seasonal change in the shoot flora diversity of hardwood forest stands on Mont St. Hilaire, Québec. Canadian Journal of Botany 49: 1713-1720.

Four stands were marked out on the flanks of East and North Hill: two straddling the interface between the hard rock slopes of East Hill and the gravel terraces rising from the shores of Lac Hertel, another on the inner flank of the eastern most Hemlock Knoll comprised of a gently sloping convex crest, a geologically complex lowland underlain by a baked limestone, and an intervening slope with numerous outcrops of a basaltic rock; and the fourth on a side slope underlain by scree gravels and a number of hard rock outcrops. The forest tree cover of all four stands is dominated by beech and sugar maple, with individuals of red oak scattered over the south-facing

hard rock slopes, and intermixed with butternut, elm and white ash on the gravel terraces. Part of the crest of one stand is occupied by a hemlock forest. All 4 stands have a rich flora of herbs and numerous species of woody plants.

The total number of shoot types during the growing season in Stand 1 was 87 species, Stand 2 had 59, Stand 3 had 75, and Stand 4 had 69. The number of winter shoots was 38, 36, 33, and 30 species respectively. A rapid rise in plant diversity was noted during the spring (46 sprouting shoots between 27 April and 14 May, 1970), whereas diversity stabilizes during the summer. Shoots of many plants begin to die back in June. In one stand (during 1970) an average of one species disappeared each month from July to September, when a fairly extended period of dying back began, coinciding with the long autumnal decline in diversity. For example, nine species disappeared in the second week of October, three in the last week of November and the last of the seasonal shoot species died during the first week of December. The seasonal trend in diversity is compared to that suggested for successive stages of succession, namely, a rapid rise in diversity to a high value, followed by a slight drop to a level which persists for as long as environmental influences remain stable.

Holland, Peter G. 1974. The growth, behaviour, ecology, and geography of Erythronium americanum in Northeast North America. Canadian Journal of Botany 52(7): 1765-1772.

Erythronium americanum Ker. (Liliaceae) was common on a low terrace of fluvioglacial gravel slopes which rise from the shores of Lac Hertel, and was less frequent on peat or gravel mounds in the stream course which crosses the terrace and on ledges across the back slope. It is seldom found on slopes steeper than 15°, the waterlogged organic soils of pits between blowdown mounds, or in the seasonally saturated soils along meltwater channels. An anamolous feature of its local geography is its presence on gently convex ridgetops and alongside streams which drain the tops and follow the interconnected ledges and depressions of the backslope, but either absence from or rarity on the back slope proper. The 1970-73 survival of bulbs transplanted into marshy ground was 10%, into closed pits between blowdown mounds 10%, onto ledges 30%, onto mounds 50%, and onto the backslope 30%. The distribution of E. americanum in Canada is comparable to that of beech, black ash, red oak, sugar maple, and yellow birch, where it grows in moist situations in the northern hardwood forest formation. E. americanum appears to grow in a range of habitats comparable to those occupied at Mont St. Hilaire.

Holland, Peter G. 1978. Species turnover in deciduous forest vegetation. Vegetatio 38(2): 113-118.

Two stands were repeatedly sampled. One covered 1.75 ha with a median altitude of 210 m and included four terrain units: a steep (17°-35°) slope, a gently sloping (4°-6°) gravel terrace, a complex system of meltwater

channels and gravel bars, and an area of semi-permanently inundated ground. Ninety-five species of vascular plants were found during 4 years of sampling - however there were few annual plants or geophytes. Perennial herbs compose the bulk of the flora and there were 16 species of large woody plants. The second stand (1.05 ha) includes three terrain units: a gently sloping convex crest underlain by basaltic rock, a steep (15°-40°) slope ranging from the crest to a boggy depression, and a narrow band of metamorphosed alkaline rocks rising 2-3 m above the inundated ground. Thirty-seven species were common to the two stands, woody plants contributing almost half that number.

Deciduous forests cover all of the first stand and 85% of the second stand, with Acer saccharum and Fagus grandifolia the dominant tree species forming the canopy. Quercus rubra grows on south facing slopes. Fraxinus americana, while a commonly encountered seedling throughout the two stands, usually attains maturity in areas of gravel soil within a metre of permanent water table. Tsuga canadensis occurs widely, but reaches its greatest density where hard rock either outcrops or is within a few centimetres of the surface. Betula papyrifera is found on steep rubbly slopes and old landslides. There are few shrubs in these woods, and the vegetation has two main layers: the canopy which reaches 10-12 m in places, and a ground layer of perennial herbs.

Herbaceous plants grow on most terrain units of each stand, but achieve greater species density in the moister sections. In general, there are fewer herbs per square metre in both the permanently wet sites and on the steep dry slopes, both of which had small numbers of distinctive, if numerally rare species. Between 1969 and 1976 there were no qualitative changes in the floras of the two stands. Over the same period mean number of species/m^2 remained virtually constant; however the species composition did change, more so in the seasonally moist environments than on the steep slopes. A turnover rate of 0.155 was calculated. Between 1969 and 1976 Claytonia caroliniana, Crepis capillaris, and Epipactis helleborine had stable frequency but occurred in different quadrats from year to year.

Holland, Peter G. 1980. Transplant experiments with trout lily at Mont St. Hilaire, Québec. Journal of Biogeography 7: 261-267.

At Mont St. Hilaire, the trout lily (Erythronium americanum Ker.) is abundant on the blow-down mounds of hardwood forested gravel terraces, patchy in seasonally flooded areas, rare in snowmelt channels and on ledges which cross the steeply sloping ground, and virtually absent from pits between blow-down mounds and the thin rubbly soils of slopes steeper than 15-20°. During 1970, 250 trout lily bulbs were transplanted into five different habitats: 1) seasonally flooded ground, 2) young blow-down mounds, 3) steep slopes, 4) pits beside blow-down mounds, and 5) ledges. These plants were then monitored during the spring seasons of 1971-74 and 1976-79. Survival on the seasonally flooded sites initially declined rapidly, then leveled off to a value of 0.12 after 6 years; survival on young blow-down mounds was similar to the flooded sites without such a rapid

decrease and survival value of 0.28; trout lilies transplanted onto steep slopes, pits beside blow-down mounds, and ledges, all declined steadily until all plants were dead. The occurrence of "safe sites", in which the trout lily has a high probability of surviving, is highest among blow-down mounds. As many as 350 such mounds were found per hectare on Mont St. Hilaire, and 10-15% are younger than 20 years.

Holland, Peter G. 1981. Eleven years of change in the species composition of permanent quadrats in deciduous forest on Mont St. Hilaire, Québec. Naturaliste Canadien 108: 311-323.

LeBlanc, Frère Fabius. 1960. Ecologie et phytosociologie des épiphytes corticoles du sud du Québec. Thèse de Doctorat, Département de Biologie, Université de Montréal, Montréal, Québec. 554 pages.

Beech (Fagus grandifolia) was the dominant tree species in a 200-m^2 quadrat on Mont St. Hilaire. The herbaceous layer, relatively depauperate in numbers of species and individuals, contained the species Epifagus virginiana, a species parasitic on beech roots, and Corallorhiza maculata, a saprophytic orchid. The moss layer had the fungus Boletus chromapes, and several mosses, of which Dicranella heteromalla was the most common on the ground and Hedwigia ciliata most common on rocks. Six trees chosen within the quadrat, three beech and three oaks (Quercus rubra), had very different epiphytic flora. While the three beech were almost entirely devoid of mosses, the oaks had several epiphytes growing on them. The bases of the oaks supported the mosses Leskea nervosa and Hypnum reptile; the trunks had Parmelia sulcata and Physcia millegrana; and the emergent roots had Hypnum reptile growing on them.

Phillips, William J. 1972. An evaluation of the relative importance index to the study of forest vegetation on Mont St. Hilaire, Québec. M.Sc. Thesis, Department of Geography, McGill University, Montreal, Québec. 106 pages.

The forests of Mont St. Hilaire are classified according to the land forms on which they are found as summarized in the following table. Maps of relative importance of the 10 most important tree species are given. Sugar maple, American beech, northern red oak, iron wood, white ash, basswood, and white birch are found in all terrain units, and of these sugar maple and American beech are by far the most widespread on Mont St. Hilaire. Eastern hemlock, yellow birch, striped maple, and red maple are found in more than half the terrain units on the mountain. Five conifers, including red and white pine, eastern white cedar, white spruce and balsam fir, and nine hardwoods, including pin cherry, largetooth aspen, black cherry, trembling aspen, butternut, cottonwood, black ash, balsam poplar, and white elm occur in less than half of the terrain units or only sporadically on Mont St. Hilaire. The tree assemblages found on the different terrain units are (dominant species underlined):

W facing slopes - Northern red oak, sugar maple, ironwood, plus white birch, red pine;
S facing slopes - Northern red oak, sugar maple, ironwood, plus white ash, white birch;
Summits - Sugar maple, northern red oak, ironwood, plus American beech, white ash;
N facing slopes - Sugar maple, American beech, plus basswood, striped maple;
E facing slopes - Sugar maple, American beech, plus ironwood, Northern red oak;
Cols - Sugar maple, American beech, white ash, basswood;
Lowlands - American beech, sugar maple, plus yellow birch, northern red oak;
Bogs - Eastern hemlock, yellow birch, red maple, white elm, white ash.

Walther, Alina. 1963. Forest ecological studies on the Monteregian Hills of southern Québec. M.Sc. Thesis, Department of Botany, McGill University, Montreal, Québec. 234 pages.

Thirty-four stands on Mont St. Hilaire were examined as part of this study on the vegetation of the Monteregian Hills (112 stands total). Environmental conditions such as topography, moisture, exposure and elevation in each stand are noted, as well as the flora present. Of the 9 dry sites on Mont St. Hilaire, the dominant tree was Quercus rubra in 5, Betula papyrifera in 2, Fagus grandifolia in 4 and Acer saccharum in 3. In the 7 mesic sites, 6 had Acer saccharum as the dominant tree and one had Fagus grandifolia. In the 6 wet mesic sites, the dominant tree was Acer saccharum in five and Tsuga canadensis in the other. Of the five wet sites, Betula lutea was dominant in two, Ulmus americana in one, Acer rubrum in one, and Tsuga canadensis in one. Overall the thesis provides a very complete summary of the floristic and vegetational relationship of Mont St. Hilaire to the other Monteregian Hills.

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* ZOOLOGY *
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Bell, G., and L.M. Wolfe. 1985. Sexual and asexual reproduction in a natural population of Hydra pseudoligactis. Can. J. Zool. 63: 851-856.

Populations of Hydra pseudoligactis were censussed during 1980-1981 in Lac Hertel and a small pond in the old orchard. Both natural and artificial substrates (glass slides) were used. Population density rose during the early part of the season to a maximum in June-July, after which a decline in the rate of asexual budding drove density down. The decline in budding rate lagged about 2 weeks behind the increase in density. High local population density on the glass slides reduced rates of budding and caused dispersal from crowded slides. Sexual individuals appeared in the middle of the growing season, near the time of maximal density, when rates of asexual

budding had begun to fall. Moreover, sexual individuals were more frequent in the site where and in the year when budding rates were lower; 66% of the variance in the frequency of sexual individuals between dates in the pond was explained by variance in the number of buds borne by asexual individuals.

Boyes, J.W., J.M. Van Brink, and B.C. Boyes. 1971. Chromosomes of Syrphinae (Diptera: Syrphidae). Miscellaneous Publications of the Genetics Society of Canada, Ottawa, Ontario. 158 pages.

Boyes, J.W., J.M. Van Brink, B.C. Boyes, and J.R. Vockeroth. 1980. Chromosomes of Eristalinae and Microdontinae (Diptera: Syrphidae). Miscellaneous Publications of the Genetics Society of Canada, No. 3, Ottawa, Ontario. 137 pages.

Gradwell, Norman. 1967. On aqueous ventilation during the internal gill stage in the tadpole of Rana catesbeiana Shaw. M.Sc. Thesis, Department of Zoology, McGill University, Montreal, Québec. 84 pages.

Gradwell, Norman. 1968. Jaw and hyoidean mechanism in the bullfrog tadpole. Canadian Journal of Zoology 46: 1041-1052.

Gradwell, Norman. 1969. Respiratory importance of vascularization of the tadpole operculum in Rana catesbeiana. Canadian Journal of Zoology 47: 1239-1243.

Gradwell, Norman. 1969. Function of internal nares in the bullfrog tadpole. Herpetologica 25: 120-121.

Gradwell, Norman. 1970. The functional morphology of gill ventilation in three species of anuran tadpoles. Ph.D. Thesis, Department of Zoology, McGill University, Montreal, Québec. 286 pages.

Jobin, Luc. 1978. Historique et situation actuelle de la Spongieuse au Mont St. Hilaire. Internal Report. Centre de Recherches forestières des Laurentides, Ste-Foy, Québec.

Gypsy moths were first noted on Mont St. Hilaire in summer 1977 when 10 ha on Burned Hill were defoliated. By the summer of 1978 defoliation extended over 259 ha on Burned Hill, Pain de Sucre, Dieppe, and Lake Hill.

Jobin, Luc. 1982. Results of aerial treatment with Dimilin^{R} and Bacillus thuringiensis for Gypsy Moth (Lymantria dispar L.) Control in Québec. Canadian Forestry Service Research Notes 2: 18-20.

In winter 1978/79 there were 2412 gypsy moth masses per hectare on the reserve sector (west slope of Lake Hill) and 9772 egg masses/ha on the public sector. After the public sector had been sprayed with Bacillus thuringiensis there were 24 egg masses/ha compared to 932 egg masses/ha on the untreated reserve sector in winter 1979/80.

Ouellet, H.R. 1966. Histoire et dispersion de la fauvette azurée Dendroica cerulea (Wilson) dans la Province de Québec, Canada. Naturaliste Canadien 93: 335-337.

Ouellet, H.R. 1967. The distribution of the Cerulean Warbler in the Province of Québec, Canada. Auk 84: 272-274.

Sightings of singing Cerulean Warblers (Dendroica cerulea) were made on Mont St. Hilaire during the summer of 1965, including the capture of one adult male in breeding condition. The birds found were in the uppermost part of the tallest trees in rather damp, mature deciduous stands where the dominant trees were sugar maple, red oak, and beech.

Ouellet, H.R. 1977. Relationships of woodpecker genera Dendrocopos Koch and Picoides Lacépède, (Aves: Picidae). Ardea 65: 165-183.

Ouellet, H.R. 1977. Biosystematics and ecology of Picoides villosus (L.) and P. pubescens (L.), (Aves: Picidae). Ph.D. Thesis, Department of Biology, McGill University, Montreal, Québec. 376 pages.

Pendlebury, George B. 1973. Distribution of the Dusky Salamander Desmognathus fuscus fuscus (Caudata: Plethodontidae) in Québec, with special reference to a population from Mont St. Hilaire. Canadian Field-Naturalist 87: 131-136.

Dusky salamanders occupy two distinctly different habitats on Mont St. Hilaire: 1) in the immediate vicinity of small, fast-moving streams which drain the surrounding topographic heights, and 2) a spring-fed pond on the lowlands just west of the mountain. In the pond the salamanders are concentrated in the narrow and relatively shallow effluence of the pond where planks, logs and rocks in damp to wet, or completely submerged situations serve as cover.

Quednau, W.F. 1983. A survey for gypsy moth parasites at Mont Saint-Hilaire and Mont Saint-Bruno, Québec. Information Report LAU-X-59. Laurentian Forest Research Centre, Ste. Foy, Québec.

The insect fauna in the Mont Saint-Hilaire and Mont Saint-Bruno areas of Quebec was investigated with Malaise and other traps in 1978, 1979, and 1980 to survey the incidence of potential parasites of the gypsy moth. Fourteen species of known gypsy moth parasites occurring in North America, both indigenous and introduced, were collected. In addition to the species already reported by Madrid and Stewart (1980) the following species that might have host associations with gypsy moth were recorded: Exorista mella (Wlk.), Phryxe pecosensis Tns., Tachinomyia nigricans Webber, T. variata Curran, Itoplectis conquisitor (Say), and Theronia hilaris (Say), all of which are native to North America. Of hyperparasites of Cotesia melanoscelus (Ratz.) the following additional species were found: Cirrospilus sp., Eupelmella vesicularis (Ratz.), Eurytoma appendigaster (Swed.) and Mesopolobus sp.

Roby, Dominique. 1982. Structures génétiques de populations naturelles de quatre espèces de lepidopteres en fonction de leur stratégie d'alimentation et de leur dispersion géographique. Ph.D. Thesis, Département de Sciences Biologiques, Université de Montréal. 231 pages.

This thesis reports on the electrophoretic diversity in populations of four lepidopterans that range from monophagous to polyphagous: Coleophora serratella (European Corn Borer), Malacosoma americana (Tent Caterpillar), M. disstria (American Forest Tent Caterpillar), and Lymantria dispar (Gypsy Moth). Only the gypsy moth was studied on Mont St. Hilaire, although both Malacosoma species do occur on the mountain.

At Mont St. Hilaire gypsy moth caterpillars feeding on either Acer saccharum, Fraxinus, Quercus, and Betula showed no significant electrophoretic differentiation at the SOX, AOX, HEX, PHALC, and EST loci. Both polymorphism and heterozygosity were low, but there was some evidence of electrophoretic differentiation in caterpillars feeding on the different host trees. Similarly there was some differentiation between the Mont St. Hilaire populations and those from other localities near Montreal.

Samarasinghe, S. 1965. The biology and dynamics of the oystershell scale, Lepidosaphes ulmi (L.) (Homoptera: Coccidae), on apple in Québec. Ph.D. Thesis, Department of Entomology, Macdonald College, McGill University, Montreal, Québec. 216 pages.

TERRESTRIAL ANIMAL ECOLOGY AND BEHAVIOUR

Caplis, Pamela. 1977. Neighbor recognition by the meadow vole (Microtus pennsylvanicus) and the role of olfactory cues. M.Sc. Thesis, Department of Biology, McGill University, Montreal, Québec. 56 pages.

Specimens of Microtus pennsylvanicus were trapped from a meadow, formerly an apple orchard, near the base of Burned Hill. In addition to meadow voles, short-tailed shrews (Blarina brevicauda) also occupy the meadow. Vole burrows were found predominantly above ground in thick grass.

Clarke, R.D., and Peter R. Grant. 1968. An experimental study of the role of spiders as predators in a forest litter community. Ecology 49: 1152-1154.

The greatest number of litter organisms on Mont St. Hilaire was found in mature maple forests. In an area 50 x 50 m adjacent to the experimental site on North Hill, sugar maple comprised 68% of the 372 trees greater than 2 m high, and beech 23%. The leaves of the litter layer were curled rather than flat or bent at midrib, and there were large interstitial spaces. Litter depth ranged between 3 and 5 cm and supported considerably larger spider populations than were reported in beech-maple litter in Michigan or in a beech forest in Europe. Spiders are active predators on arthropleonous collembola and scolopendromorph centipedes in the leaf litter but not on juliform millipedes.

Dobson, Charles. W., and Robert E. Lemon. 1979. Markov sequences in songs of American thrushes. Behaviour 68: 86-105.

Detailed analyses of the songs of veeries, hermit thrushes, and wood thrushes from Mont St. Hilaire are presented. The apparent complexity of veery songs arises from varying the order of a relatively modest number of song types. The hermit thrush varies song order but also draws on a larger song repertoire. The wood thrush song is most complex in that syllables or groups of them are recombined in different orders to produce new songs.

Giraldeau, Luc-Alain. 1976. Central place foraging: quantitative tests of a patch use model in eastern chipmunks (Tamias striatus). M.Sc. Thesis, Department of Biology, McGill University, Montreal, Québec. 120 pages.

Giraldeau, Luc-Alain, and Donald L. Kramer. 1982. The marginal value theorem: a quantitative test using load size variation in a central place forager, the eastern chipmunk, Tamias striatus. Animal Behaviour 30: 1036-1042.

Grant, Peter R. 1976. An 11-year study of small mammal populations at Mont St. Hilaire, Québec. Canadian Journal of Zoology 54: 2156-2173.

Trapping of small animals was carried out from 1966 to 1976 in the snow-free period, mainly in June; trapping was done at 46 grids, each with 25 Longworth traps, which were mostly placed in forested habitat on slopes facing towards Lac Hertel. Of the 1051 individuals captured, two-thirds were Peromyscus spp., mainly P. maniculatus; Tamias striatus was the second most abundant (10-15% of total). The capture of seven individuals of Microtus pensylvanicus is noteworthy in that all were caught at least 1000 m from the nearest grassland, which is the usual habitat of this species. This study shows that Peromyscus and Clethrionomys numbers fluctuate out of synchrony at Mont St. Hilaire. Peromyscus, Clethrionomys, and Blarina varied annually in June numbers during an 11-year period, with Peromyscus fluctuating to a greater extent than the other two species and showing very pronounced peaks five years apart. Twenty-seven species of mammals are found on Mont St. Hilaire, of which 21 were listed by Wrigley (1967); this study also confirms the existence of Sorex fumeus.

Herzog, A.G. 1972. The variation and regulation of Clethrionomys mating behaviour. M.Sc. Thesis, Department of Biology, McGill University, Montreal, Québec. 76 pages.

The behaviour of Clethrionomys gapperi collected at Mont St. Hilaire was compared with that of C. glareolus from the British mainland and an island off Wales, in order to determine if taxonomic similarities could be found in the three. Three aspects of bank vole biology were examined: 1) female activity during the estrous cycle; 2) mating behaviour, and 3) use of vocalization in interaction.

Kramer, Donald L., and William Nowell. 1980. Central place foraging in the eastern chipmunk, Tamias striatus. Animal Behavior 28: 772-778.

Lechowicz, Martin J. 1982. The sampling characteristics of electivity indices. Oecologia 52: 22-30.

Gypsy moths, Lymantria dispar, have been present on Mont St. Hilaire since about 1977. The gypsy moth larvae studied were feeding in a Quercus-Acer-Fraxinus forest on the south face of Lake Hill. Larval host preferences, determined using electivity indices, are consistent with those recorded in Mauffette (1981).

Lechowicz, Martin J. 1983. Leaf quality and the host preferences of gypsy moth in the Northern Deciduous Forest. Forest defoliator - host interactions: a comparison between gypsy moth and spruce budworms. USDA Forest Service, General Technical Report NE-85: 67-82.

The first record of gypsy moth on Mont St. Hilaire was in 1977, when 10 hectares of the forest on Burned Hill, on the southwest face of the mountain, were severely defoliated. By 1978 the infestation had spread to 259 hectares, of which 195 were severely defoliated; this area included 123 hectares of a study site on Lake Hill. Serious infestations were limited to the more xeric forests on the mountain. There were no simple correlations between defoliation by gypsy moth and interspecific variation in time of leaf emergence, foliage, concentrations of nitrogen, water, or polyphenolics, toughness, or leaf pH and buffering capacity. The author suggests that gypsy moth larvae preferentially attack trees that have high sugar:tannin ratios in their young foliage.

Lechowicz, Martin J., and Luc Jobin. 1983. Estimating the susceptibility of tree species to attack by the gypsy moth, Lymantria dispar. Ecol. Entomol. 8: 171-183.

Numbers of gypsy moth larvae feeding on 922 individual trees on the south face of Lake Hill were used to calculate an index of host preference for this polyphagous folivore. Quercus rubra, Populus grandidentata, Ostrya virginiana, Amelanchier spp. and Acer saccharum were preferentially attacked by gypsy moth larvae. Prunus serotina, Betula alleghaniensis, Acer rubrum, A. pensylvanicum, Fraxinus americana, Ulmus rubra, P. pensylvanicum, and B. papyrifera were avoided but all tree species were attacked to at least some degree.

Lemon, Robert E. 1971. Analysis of song of red-eyed vireos. Canadian Journal of Zoology 49: 847-854.

Lemon, Robert E., and C. Chatfield. 1973. Organisation of song of rose-breasted grosbeaks. Animal Behaviour 21: 28-44.

Lemon, Robert E., and J. Struger. 1980. Acoustic entrainment to randomly generated calls by the frog Hyla crucifer. Journal Acoustic Society of America 67: 2090-2095.

Madison, Dale M. 1985. Activity rhythms and spacing. In Biology of New World Microtines. Edited by R. Tamarin. Amer. Soc. Mammal Spec., Publ. No. 8, pp. 373-419.

Madrid, Francisco, J. 1979. Laboratory and field studies on Lymantria dispar L. (Lepidoptera: Lymantriidae) in Québec. Ph.D. Thesis, Department of Entomology, Macdonald College, McGill University, Montreal, Québec. 190 pages.

Parasites of the gypsy moth collected at Mont St. Hilaire include: Parasotigena silvestris, Sarcophaga aldrichi, Blepharipa pratensis, Exorista larvarum, Brachimeria intermedia, Apanteles melanoscelus, Pimpla pedalis, Phobocampe disparis, and Compsilura concinnata. The most important predator of the gypsy moth was Blepharia pratensis. Three species of insect predators were found to attack gypsy moths: Calosoma frigidum, Podisus maculiventris and a Euschistus nymph. Four species of arachnids were seen eating adult gypsy moth males trapped in their webs: Agelenopsis sp., Coras sp., Philodromus praclustris, and Callobius bennetti. Fifteen species of birds found on Mont St. Hilaire prey upon gypsy moths: 1 piciform and 14 passeriforms.

Madrid, Francisco J., and Robin K. Stewart. 1981. The influence of some environmental factors on the development and behavior of the gypsy moth (Lymantria dispar L.) in Québec. Ann. Soc. Ent Québec 26: 191-211.

Part of the first author's Ph.D. thesis (1979), this study examines the life history of the gypsy moth Lymantria dispar on Mont St. Hilaire. Eggs of the gypsy moth were present in the field from mid-July, and began hatching in the first week of May the next year. Most eggs hatched in the second and third weeks of May, and all first instar larvae had emerged by the end of that month. Seventy-four percent of the pupae were female, but only 42% of the parasitized and 59% of the diseased pupae were female. In fall 1977, there were 6410 egg masses/ha with an average of 366 eggs/mass; in fall 1978, there were 9760 egg masses/ha with 320 eggs/mass on average. About 85% of the eggs oviposited in 1977 hatched in spring 1978.

Madrid, Francisco J., and Robin K. Stewart. 1981. Ecological significance of cold hardiness and winter mortality of eggs of the gypsy moth, Lymantria dispar L. in Québec. Environmental Entomology 10: 586-589.

The percentage of gypsy moth eggs laid at or below 1.5 m in height was 25 and 27% in 1977 and 1978, respectively; 1.5 m is the approximate snow depth in winter. In 1977, 87% of eggs laid below a height of 1.5 m hatched, whereas 83% of those laid at greater than 1.5 m hatched. Most eggs above snow cover will hatch, but there is a direct relationship between mortality level, degree of cold, and time of exposure to cold: mortality increased with exposure to lower temperatures. Eggs acclimated at -20°C and -12°C had significantly lower mean super cooling points than those acclimated at -7°C and 0°C. The authors suggest that gypsy moth populations in Quebec are well able to overwinter, and there is no temperature barrier to more northern dispersal. Thus the rate of dispersal is not dependent on the development of a more cold-hardy ecotype.

Mauffette, Yves. 1981. Larval feeding preferences and their consequences for the gypsy moth in southern Québec. M.Sc. Thesis, Department of Biology, McGill University, Montreal, Québec. 188 pages.

The larval feeding preferences of the gypsy moth (Lymantria dispar) can be divided into three basic categories: highly preferred, intermediate, and clearly avoided hosts. Preferred hosts include Quercus rubra, Ostrya virginiana, Amelanchier spp., Salix sp. and Populus grandidentata. Intermediate hosts include Tilia americana, Prunus serotina, Betula papyrifera, Populus tremuloides, Fagus grandifolia, Ulmus americana, Acer saccharum and Betula populifolia. Avoided hosts include Carya cordiformis, Betula lutea, Acer negundo, Prunus pensylvanica, Acer rubrum, Populus deltoides, Pinus strobus, Acer saccharinum, Pyrus malus, Juglans cinerea, Fraxinus americana, Ulmus rubra, Carya ovata, Acer pensylvanicum, Fraxinus nigra and Fraxinus pensylvanica. Some differences in feeding preferences existed between Mont St. Hilaire gypsy moths and those reported in New England; for example, O. virginiana although strongly preferred in Quebec is only an intermediate host in New England.

Feeding on Populus tremuloides, P. grandidentata, Betula populifolia, Quercus rubra and Tilia americana promoted rapid development of the larvae; feeding on Acer saccharum, Fagus grandifolia or Betula papyrifera slowed larval development. Most tree species inducing a rapid development carried relatively large larval populations. Male larvae develop faster than females on all hosts. Evidence in this study supports the prediction that female sex ratio will decrease with increasing population density.

Mauffette, Yves, and Martin J. Lechowicz. 1984. Differences in the utilization of tree species as larval hosts and pupation sites by the gypsy moth, Lymantria dispar (Lepidoptera: Lymantriidae). Canadian Entomologist 116: 685-690.

Host preferences of larval gypsy moth (see Mauffette 1981) are inversely related to pupal hosts; hosts more preferred by larvae were less preferred by pupae, and vice versa. For example, pupae were disproportionately abundant on host species like Acer pensylvanicum, Carya ovata and Juglans cinerea which are not generally favoured by larval hosts. Conversely, favoured larval hosts such as Quercus rubra and Ostrya virginiana carried lower numbers of pupae than expected from the numbers of larvae feeding on them.

Mauffette, Yves, Martin J. Lechowicz, and Luc Jobin. 1983. Host preferences of the gypsy moth, Lymantria dispar (L.), in southern Québec. Canadian Journal of Forest Research 13: 53-60.

Differences in host preferences of larval gypsy moth were found between populations at Mont St. Hilaire (see Mauffette 1981) and New England. For example, Ostrya virginiana is strongly preferred in Quebec in contrast to New England where it is only an intermediate host; Betula populifolia and Populus tremuloides are both preferred in New England but classed as intermediate hosts in this study. Overall, the forest composition appears to play only a limited role in altering gypsy moth host selection, but does especially affect the utilization of intermediate hosts.

Mineau, P., and D. Madison. 1977. Radio-tracking of Peromyscus leucopus. Canadian Journal of Zoology 55: 465-468.

Seven Peromyscus leucopus were tracked at various sites during the summer of 1974. The movement of two of these mice in open beech-maple forest showed no diurnal surface movement, the mice being active on the woodland litter throughout the night. Home ranges were calculated to be 1.26 ha (male) and 0.91 ha (female).

Rosen, M. 1974. The vocal behaviour of the spring peeper, Hyla crucifer. M.Sc. Thesis, Department of Biology, McGill University, Montreal, Québec. 33 pages.

During the breeding season on Mont St. Hilaire Hyla crucifer males emit their "peep" mating calls repeatedly at fluctuating rates. When two males alternate calls, one individual (the "follower"), usually calls within 100 ms from the ends of the calls of the "leader". The leader's rate of calling during alternation remains unchanged relative to just before and after the interaction. From playback of synthetic calls the author suggests that the interaction results from both excitation and inhibition by the leader's calls. Several males may interact vocally by forming trios, quartets and pentets, which appear to be series of duets as described above. These interactions are implicated in the spacing of territorial males around the breeding site. Males may also emit a different call, a "trill", which apparently reflects a higher degree of aggressive motivation.

Rosen, M., and R.E. Lemon. 1974. The vocal behaviour of spring peepers, Hyla crucifer. Copeia 4: 940-950.

The study area was a small pond on Mont St. Hilaire located along the west edge of the old orchard. Emergent vegetation in the pond is rare, but there are partly submerged fallen branches. Aquatic grasses appear during the summer. Breeding activity of Hyla crucifer is largely restricted to May. During 1972, the first spring peepers arrived at the pond on 7 May, whereas in 1973 they arrived 16 April. During these years, ice was present on the pond until 5 May and 14 April, respectively. On 7 May 1971 there were 17 calling individuals of Hyla crucifer at the pond, whereas the next evening there were 38. During the period 8 May to 3 June 1971, the number of calling individuals varied between 32 and 41. By 5 June 1971 there were only 5 calling individuals and after this date chorusing ceased.

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* LIMNOLOGY *
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Grant, Peter R., and Rosemary J. Mackay. 1969. Ecological segregation of systematically related stream insects. Canadian Journal of Zoology 47: 691-694.

Grimaldi, John. 1967. Comparative growth of the yellow perch, Perca flavescens, in lakes and rivers in Québec. M.Sc. Thesis, Department of Zoology, McGill University, Montreal, Québec. 104 pages.

Lac Hertel is approximately square in shape and is surrounded by a deciduous forest; it has an area of 37 ha and a maximum depth of 9 m. The lake bottom is muddy and the littoral zone supports a thick growth of rooted aquatic plants. The most abundant fishes are Ambloplites rupestris (Rock Bass), Lepomis gibbosus (Pumpkinseed), Perca flavescens (Yellow Perch), and Notemigonus crysoleucas (Golden Shiner). Also abundant are Semotilus corporalis (Fallfish), Catostomus commersoni (White Sucker), Ictalurus nebulosus (Brown Bullhead), and Esox lucius (Northern Pike).

There is a greater relative abundance of female perch with increase in age. In young perch there is no difference in growth between male and female; however, after the second year in Lac Hertel, female perch are longer for given ages. Of the five sampling locations observed in Québec, Lac Hertel perch show the poorest growth rate: the population is definitely stunted. Growth is comparable to that of other stations during the first year; from the second year on, the growth in this lake is much slower than other locations. In the fifth, sixth and seventh years, the Lac Hertel perch are a third smaller than perch from Iles de la Paix (which has the next smallest perch). In the sixth year, the perch in Lac Hertel are only one third the weight of the Iles de la Paix perch, which on average weigh less than the other three stations at this age. The yearly increments of growth for the perch of Lac Hertel exhibit a continuous decrease during the life span, from approximately 22 mm in the second year to 10 mm in the last year of life (up to 7 years).

Grimaldi, John, and G. Leduc. 1973. The growth of yellow perch in various Québec waters. Naturaliste Canadien 100: 165-176.

Yellow perch (Perca flavescens) were caught by using a 22.5-m long gill net of 1.90-cm mesh set at 2 to 4.5 m in various locations of Lac Hertel and by using beach seines (0.63-cm mesh). Mean lengths of yellow perch caught at Lac Hertel during 1965 ranged from 82 to 157 mm for males, and 82 to 170 mm for females. Growth rates for yellow perch are slower in Lac Hertel than in other bodies of water in Québec. Yellow perch mature in Lac Hertel at age three.

Kalff, Jaap. 1972. Net plankton and nannoplankton production and biomass in a north temperate zone lake. Limnology and Oceanography 17: 712-720.

Lac Hertel, which is fed by two small streams, is a small lake (29 ha) with a maximum depth of 6 m. Upwellings of molten rock during the Cretaceous now form the east and west sides of the mountain. The bowl shaped valley between them was deepened and later dammed at the southern end by the action of the Pleistocene ice sheets, forming the lake. The natural

dam has been man-improved to raise the lake surface to an elevation of 200 m above sea level. The 274-ha watershed is completely covered by a mature beech-maple forest. The lake normally freezes in early December and remains frozen until the latter half of April; the ice, at maximum thickness of about 40 cm, is covered by snow (average 55 cm/month during 1 January - 1 April, annual total 269 cm).

The epilimnetic lake water has a summer alkalinity between 24 and 33 mg/litre as $CaCO_3$ and can be characterized as bordering between soft and medium hard. The summer pH generally fluctuates between 7.5-8.5 and under ice cover, the pH is around 6.8. The seasonal variation in pH appears to be largely the result of extensive beds of submerged macrophytes growing abundantly down to a depth of 4 m. Summer temperature stratification is commonly established during late May and unless destroyed by strong winds remains intact until mid-September. During this period epilimnetic waters warm to between 23 and 28°C, and the thermocline extends from between 4 and 5 m to near the lake bottom, where summer water temperature ranges between 9 and 15°C. Extensive filling of the lake basin with allochthonous matter has resulted in a shallow basin with no more than 10% of the lake surface overlying 5 m or more of water.

The present degree of eutrophication was reached virtually without man's direct influence. The lake lies in a watershed which has only one summer cottage and which has remained totally wooded. Allochthonous organic matter in the form of deciduous leaves and dissolved organic matter enter the lake through the brooks, and runoff, or by wind action.

Integrated daily primary production measurements revealed an August peak in 1966 with a maximum of about 1100 mg $C \cdot m^{-2} \cdot d^{-1}$ followed by an irregular and interrupted decline until the end of the year. The integrated daily production was zero from January 1967 until early April when daily rates of phytoplankton photosynthesis rose rapidly to about 600 mg C/m^2. Annual primary production was estimated at 82 and 78 g/m^2 in 1966 and 1967, respectively.

Biomass levels recorded ranged between 21 and 1232 mg/m^3 with the nanoplankton contribution ranging from 8.9% in July to 99.3% in December. The August epilimnetic community is dominated by Tabelleria fenestra and Anabaena flos-aquae. Anabaena planctonica contributed about half of the epilimnetic net plankton biomass in July, with nearly all of the remainder contributed equally by Fragilaria crotonensis and T. fenestra.

Knoechel, Roy. 1975. A study of the seasonal phytoplankton species dynamics in a north-temperate zone lake, utilizing ^{14}C track autoradiography. Ph.D. Thesis, Department of Biology, McGill University, Montreal, Québec. 147 pages.

Knoechel, Roy, and Jaap Kalff. 1975. Algal sedimentation: the cause of a diatom blue-green succession. Verhandlungen Internationale Vereinigung Für theoretische und angewandte Limnology 19: 745-754.

Experiments carried out in naturally eutrophic Lac Hertel show that the transition in algal dominance from the diatom Tabellaria fenestra to the blue-green alga Anabaena planctonica occurred during late July 1973. The distributions with depth of Tabellaria and Anabaena often reveal a population peak at the top of the thermocline. Cellular carbon fixation rates of both species exhibited a consistent response to light on a day to day basis despite large differences in the total incident radiation. There is a general decline in the maximum fixation rates during the summer; however, the reduction in carbon fixation of Anabaena is greater, so that its initially higher growth rate is exceeded by Tabellaria during late July and August. Mean cell volume estimates of 212 μm^3 for Anabaena and 528 μm^3 for Tabellaria resulted in computed carbon contents of 36 and 44 picograms per cell, respectively.

Knoechel, Roy, and Jaap Kalff. 1976. The applicability of grain density autoradiography to the quantitative determination of algal species production: A critique. Limnology and Oceanography 21: 583-590.

Knoechel, Roy, and Jaap Kalff. 1976. Track autoradiography: a method for the determination of phytoplankton species productivity. Limnology and Oceanography 21: 590-595.

Knoechel, Roy, and Jaap Kalff. 1978. An in situ study of the productivity and population dynamics of five freshwater planktonic diatom species. Limnology and Oceanography 23: 195-218.

Carbon fixation rates were determined for five species of planktonic diatoms: Asterionella formosa Hassall, Fragilaria crotonensis Kitton, Melosira italica Ehrenberg, Synedra radians Kützing, and Tabellaria fenestrata Kützing. Cell growth rate in all five species was determined primarily by the maximum photosynthetic rate (P_{max}), which, in Lac Hertel, is controlled by nutrient supply. Although severe photoinhibition was observed at high light intensity, population growth was nevertheless maximal near the surface of the lake over the longer term. Cell growth determined only the maximum possible population growth rate, whereas losses, primarily through sinking, determined the actual population size. Sinking seemed to be largely a function of death rate, which was thus the factor ultimately controlling the size of the diatom population in Lac Hertel.

Mackay, Rosemary J. 1968. Seasonal variation in the structure of stream insect communities. M.Sc. Thesis, Department of Zoology, McGill University, Montreal, Québec. 101 pages.

West Creek is 1.7 km long, but during most summers the upper third dries up; halfway downstream is Thompson's pond, about 130 m^2 in area, which was dug in 1964 to provide a fire-fighting reservoir. The stream contains approximately 150 species of insects divided into seven families:

Ephemeroptera - 15 spp., Plecoptera - 12 spp., Odonata - 1 sp., Neuroptera - 2 spp., Trichoptera - 29 spp., Coleoptera - 10 spp., Diptera - 82 spp. They inhabit sand, gravel, stone, leaf and leaf-detritus substrates; the primary source of food was fallen leaves. Characteristic communities were found in each habitat with leaves supporting the most species (92 spp.), and sand the least (61 spp.). Most species were stenothermal, their linear distribution being determined mainly by the extent of summer drought and by substrate type.

Species diversity was higher in winter and summer than in spring and autumn. The estimated annual standing crop of the stream was 3111 insects/m^2 (2.21 g dry weight/m^2), with biomass lowest in the autumn. Leaf and store habitats had the highest biomass/m^2 (1.87 and 1.91 g respectively), gravel had the lowest biomass (0.91 g). The high species diversity and relatively low standing crop are typical of an oligotrophic environment.

Mackay, Rosemary J. 1969. Aquatic insect communities of a small stream on Mont St. Hilaire, Québec. Journal Fisheries Research Board Canada 26: 1157-1183.

Weekly sampling between March 1966 and March 1967 revealed at least 120 species of insects in sand, gravel, stones, leaves, and leaf detritus habitats. Fallen leaves were the primary food source. Characteristic communities of insects were found in each habitat. Widely distributed species were usually more abundant in one of the five habitats than in the others. Some species changed their habitats with age. Congeneric species either occupied different parts of the stream or developed at different times of the year. Linear distribution of insects was determined by the substrate type, by the extent of summer drought and the ability to avoid desiccation, and in some species by upstream flying of adult females. The species composition of each community may be characteristic of small slow-flowing streams in deciduous forests in eastern Canada.

Mackay, Rosemary J. 1972. Temporal patterns in life history and flight behaviour of Pycnopsyche gentilis, P. luculenta and P. scabripennis (Trichoptera: Limnephilidae). Canadian Entomologist 104: 1819-1835.

Three species of Pycnopsyche inhabit West Creek, living on allochthonous organic materials. The rarest of the three, P. scabripennis, grows faster than the other two species, P. gentilis and P. luculenta. P. scabripennis over-winters as 5th instar larvae, and then pupates at the end of July; the pupal period lasts 10-14 days, and adults emerge in early August. Pycnopsyche gentilis and P. luculenta over-winter as 3rd or 4th instar larvae, and no 5th instar larvae appear before the end of February; both species pupate in August, and adults emerge in late August or September. Flight lasts 2-4 weeks in all three species, during which time they reproduce.

Pycnopsyche scabripennis larvae live in leaves and detritus during the winter. During the spring thaw the 5th instar larvae do not get carried downstream, and in early May they burrow 2-3 cm into coarse gravel (4-16 mm in diameter) in swift flowing areas. During pupation the case remains attached to the substrate. Pycnopsyche gentilis larvae over-winter in hardwood leaves and occasionally leafy detritus. During the spring thaw, they passively enter the water and drift downstream, then fall in allochthonous detritus and remain until the end of June; they then crawl under large stones or submerged logs and remain hidden and inactive until the prepupal stage. Pycnopsyche luculenta larvae, which spend the winter in patches of leaf and twig detritus, are also displaced by the spring thaw, but less than P. gentilis; the larvae then aestivate for 4-6 weeks under large stones and logs. Pycnopsyche scabripennis adults emerge at the beginning of August, and remain active for 4-5 weeks. Pycnopsyche gentilis and P. luculenta adults emerge synchronously during the last week of August, and remain active until the end of September.

Mackay, Rosemary J. 1972. The life cycle and ecology of Pycnopsyche gentilis (McLachlan), P. luculenta (Betten), and P. scabripennis (Rambur), (Trichoptera: Limnephilidae) in West Creek, Mont St. Hilaire, Québec. Ph.D. Thesis, Department of Biology, McGill University, Montreal, Québec. 103 pages.

Three species of Pycnopsyche caddis flies occur in West Creek. The life history of P. scabripennis is distinct from P. gentilis and P. luculenta which are contemporaneous and similar in size. Adult males of each species differ in the peak time of arrival at light when active on the same night. Field studies and laboratory experiments show that the populations of P. gentilis and P. luculenta overlap but are proportional to the amount of preferred habitat space. Pycnopsyche gentilis uses leaves for case materials and habitat; P. luculenta can utilize leaves or twigs, but remains near twigs. Both species feed preferentially on fungally-infected leaves; P. luculenta ingests less leaf material if twigs are available. Larval habitat is uninfluenced by mineral substrates except during case-construction by 5th-instar P. gentilis and aestivation by P. scabripennis. Larvae and leaves are washed downstream during the spring thaw. Subsequent crowding in the reduced habitat space may result in competitive interactions.

Mackay, Rosemary J. 1977. Behavior of Pycnopsyche (Trichoptera: Limnephilidae) on mineral substrates in laboratory streams. Ecology 58(1): 191-195.

Three species of Pycnopsyche (Trichoptera: Limnephilidae) caddisflies collected from West Creek (P. gentilis, P. luculenta, P. scabripennis) were used in laboratory experiments to determine whether mineral particle size was a significant factor in habitat selection. The choice of mineral substrates available to the Pycnopsyche ranged from medium sand to small pebbles. P. gentilis and P. luculenta avoided mineral substrates, whereas

mature larvae of P. scabripennis burrowed into gravel particles 4-16 mm in diameter for a 3-month aestivation period; apart from this short-term behaviour, all species responded positively only to organic substrates and showed no mineral substrate selection that was concordant with larval distribution in West Creek. Only those species which use mineral particles for cases or burrows demonstrated a size preference. The very precise size of particles selected by aestivating P. scabripennis larvae may be an important limiting factor for this species.

Mackay, Rosemary J., and Jaap Kalff. 1969. Seasonal variation in standing crop and species diversity in a small Québec stream. Ecology 50: 101-109.

The seasonal changes in abundance and species diversity of insect communities was monitored in five habitat types in West Creek. This creek rises from slow springs at an altitude of about 300 m and flows through thick beech-maple forest for 1.7 km until it enters Lac Hertel. The creek is almost undisturbed by man; the surrounding forest has not been cut for at least a century. The water of West Creek has an annual temperature range from 0° to about 17°C. The flow ranges from 1 litre/s in the autumn after a dry summer, to 130 litre/s in April. During most summers the upper third of the stream dries up. The width of the stream varies from 30 cm to 2 m, though some parts of the lower reaches may flood to as much as 4 m during the spring thaw. The amount of light reaching the stream bottom is very low (due to leaves in summer, snow and ice in winter): there are no higher plants growing in the stream, algal growth is sparse, and moss is found only on exposed surfaces of immovable boulders.

Four stations 60 m in length were chosen as representative of typical areas of the stream: I-300 m from the source, 3-5 cm deep, flowing over coarse sound, gravel and pebbles; II-700 m from the source, and the upper limit of flowing water during 1966, is similar to I except for more extensive areas of sand and silt; III-halfway along the stream, current slow, substrate mainly sand and silt - entering this station was a small tributary carrying precipitated iron salts from underground seepage water that was almost deoxygenated when it joined the mainstream; IV-300 m from Lac Hertel, has a substrate of boulders, cobbles, and pebbles resting on gravel and occasional sandy patches.

At least 120 species of aquatic insects were collected from West Creek. The proportion of total macrofauna made up by non-insect groups is extremely small, so calculations of standing crop based on insect fauna can be taken as representative of macrofauna as a whole. The insect species sampled represent the following seven orders: Ephemeroptera, Plecoptera, Odonata, Neuroptera, Trichoptera, Coleoptera and Diptera. Monthly percentage composition, numbers/m^2 and biomass of each of the seven orders are given in the following five habitat types: sand, gravel, stones, leaves, and detritus. Primary food material of insects was fallen leaves. Biomass per unit area was least in gravel and increased through gravel, stones, leaves, and detritus. The annual standing crop of the stream as a whole was

approximately 3000 insects/m^2 and 2 g/m^2 (dry weight). Detritus leaves supported the highest number of species (92) and sand the least (61). Species diversity was higher during summer and winter than during spring and autumn. When compared with other aquatic environments, the bottom fauna of the stream has oligotrophic features, including a large number of species and an annual standing crop of poor to intermediate richness.

Mackay, Rosemary J., and Jaap Kalff. 1973. Ecology of two related species of caddis fly larvae in the organic substrates of a woodland stream. Ecology 54: 499-511.

Sampling of two species of Pycnopsyche (Limnephilidae, tribe Stenophylacini) larvae was done in West Creek to determine how larvae exploit allochthonous organic material and other resources and to what extent they interact competitively. Ninety percent of P. gentilis larvae live in fallen leaves, which they use as food and for case materials; the remaining 10% occur in detritus with P. luculenta. The distribution of each species from September through March depends on the amount of preferred habitat space available. Larvae in leafy habitats are washed downstream during the spring thaw by habitat displacement; in 1971 two-thirds of the P. gentilis population and nearly half of the P. luculenta population were displaced. The subsequent shortage of leafy habitat space and crowding of remaining larvae may result in competitive interaction and predation. The niche size of P. gentilis is smaller than that of P. luculenta. There is some niche overlap, but it apparently does not normally result in competition between the species. Habitat selection, from April to September, appeared to be influenced only by the type of organic material available.

Morgan, Keith C. 1977. Studies on the autecology of the freshwater algal flagellate Cryptomonas erosa skuja. Ph.D. Thesis, Department of Biology, McGill University, Montreal, Québec. 211 pages.

Growth of the freshwater phytoflagellate Cryptomonas erosa, isolated from Lac Hertel, was maximal at moderately high light and temperatures (0.045 ly·min^{-1}, 23.5°C), whereas at low temperatures growth was much reduced, and the cells saturated and inhibited at very low light intensities. Light stress is induced by continuous illumination, also, significant quantities of phycoerythrin increases the cells' susceptibility to light and may account for the depth distribution of cryptomonads in nature. There was a wide range in cell volume (300-9000 μ_m^3). Although cryptomonads grow faster than diatoms and blue-green algae, their absolute abundance in Lac Hertel is probably limited by zooplankton grazing.

In chemostat culture carbon uptake and cell division of C. erosa were affected differently by the rate of phosphorous supply; photosynthesis was limited by light at high dilution rates and by phosphorous at low dilution rates, whereas cell division was P-limited at all growth rates examined. Incubation of C. erosa in the dark resulted in a decline in cell numbers and

cell volume/cell carbon. At high temperatures (15° and 23.5°C) reserve carbon was quickly exhausted, followed by rapid cell death, whereas at low temperatures (1°C) the cells survived a lengthy dark period (up to 80 d) because of slowed respiration of storage carbohydrate. Heterotrophic metabolism of C. erosa was found to be negligible in culture.

Morgan, K., and Jaap Kalff. 1975. The winter survival of an algal flagellate - Cryptomonas erosa (Skuja). Verhandlungen Internationale Vereinigung Für theoretische und angewandte Limnology 19: 2734-2740.

Cryptomonas erosa, a freshwater nanoplankton, was isolated in axenic culture from Lac Hertel and grown in culture. The growth response of C. erosa to light at 15°C conforms to a pattern characteristic of all photosynthetic species, with a linear increase in carbon fixation at suboptimal light, and saturation and inhibition at higher intensities. In comparison to most diatoms, green algae, and blue-green algae in culture, C. erosa is saturated and inhibited at very low light levels, which suggests that the algae is less able to adapt to high light and probably relies on motility to maintain itself in a suitably low light environment in nature. The mean cell volume of C. erosa at 15°C is positively correlated with light intensity, so that cells grown at 14 $ly \cdot d^{-1}$ are over 2.5 times larger than those at 0.3 $ly \cdot d^{-1}$. Growth of C. erosa at 4°C reduces the light level at which the cell is saturated and inhibited, and lowers the estimated compensation intensity to approximately 0.03 $ly \cdot d^{-1}$. Cells at 4°C contain 2 to 8 times more carbon than those grown at 15°C, with carbon forming a greater proportion of the cell mass; however, cell division is significantly retarded at this temperature.

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* **HYDROLOGY** *
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Fuggle, R.F. 1968. A note to compare the records from three rain gauges similarly exposed at Mont St. Hilaire, Québec. McGill University Climatological Bulletin 4: 49-51.

Goswami, R.J. 1962. Hydrologic regime of Lac Hertel, Mont St. Hilaire, Québec. M. Eng. Thesis, Department of Engineering, McGill University, Montreal, Québec. 259 pages.

Lac Hertel is located at the lowest part of the inner basin and because it is surrounded by the roughly circular peaks of Mont St. Hilaire, it is thus partially sheltered from the effect of wind. The banks of the lake are covered by forests with a watershed area of about 180 hectares. The lake is shallow, the deepest sounding being approximately 8.2 m in 1961; the lake is deepest on the north-east sides where the lower slopes of the east hill-north hill complex rise directly from the lake, whereas the western half of the lake is flat-bottomed and shallow.

The main phases of the hydrologic cycle are precipitation, infiltration, runoff, transpiration and evaporation. Meterological data taken at the St. Hubert Meteorological Station are more applicable to Mont St. Hilaire than those taken at the McGill University Observatory. The runoff coefficient for the drainage basin of Lac Hertel was found to vary from 0.416 to 0.484 from theoretical calculations for 1960 and 1961. The annual runoff for 1960 and 1961 was calculated to be 469 mm and 430 mm respectively. The average runoff coefficient calculated from observed hydrograph data for the period July 1 to August 15, 1962 was 0.0198 and 0.0232 for the drainage basins contributory to the West and North Creek, respectively. Areas contributory to these two creeks together constitute 72% of the total drainage area into the lake.

The average percentage increase of base flow after rains is more pronounced in the North Creek than in the West Creek. Annual loss of surface water due to evaporation for 1960 was calculated to be 774 mm, about 71.5% of the total precipitation. Loss of water by seepage was estimated to be $916{,}000 \cdot d^{-1}$, from measurements done on July 2 and July 4, 1962.

Lewis, John E., and B. Singh. 1978. An initial investigation of radiative exchange around a tree trunk surrounded by snow. McGill University Climatological Bulletin 23: 15-29.

During peak radiative periods during the winter, insolation on the tree trunk is about 0.2 to 0.3 $ly \cdot min^{-1}$ higher than on the surrounding snow pack. Radiative exchanges, particularly long wave emission from the tree trunk to the snow pack, are the contributory factors for the development of the doughnut-shaped depressions over the winter snow pack of a hardwood forest. Also, the turbulent wind conditions produced by the protrusion of the tree trunk above the snow has some effect in the formation of these depressions. In addition, the establishment of a snow pack allows the tree trunk to become a conductor of stored soil heat. Radiation penetration through the snow pack to the trunk may also be important.

Munro, D.S.M. 1968. Evaporation measurements for Lac Hertel, Mont St. Hilaire. McGill University Climatological Bulletin 4: 40-48.

Mean daily evaporation values for Lac Hertel were recorded during the period 3 July until 24 September 1967. Total evaporation during this period was approximately 250 to 300 mm. The highest evaporation values correspond to the weeks with highest net radiation. Evaporation is the second largest cause of water loss in Lac Hertel, removal of water for the town of Beloeil taking the largest portion of the water. Rainfall was the major contributor of water to the lake, streamflow from West and North Creeks having only a minor effect on the water budget. Most of the radiation received at the lake is utilized for evaporation.

Rouse, Wayne R. 1967. A preliminary report on topoclimatic research at Mont St. Hilaire, Québec. McGill University Climatological Bulletin 1: 15-16.

Differences in soil moisture on Mont St. Hilaire were large between north and south slopes during the spring: north slope soils show 12 cm more stored water than south slope soils. At summer solstice (1966) this difference decreased to 8 cm and at the beginning of August was 5 cm. In mid-September this difference had increased to 10 cm. At the summer solstice substantial differences in soil temperatures and beneath-canopy air temperatures were observed between slopes. These differences increased downward, with the air temperature near the soil surface showing up to 2°C higher values on the south slope than on the north, and soil temperatures at the 45 cm depth giving readings up to 4°C greater.

Rouse, Wayne R. 1970. Relations between radiant energy supply and evapotranspiration from sloping terrain: an example. Canadian Geographer 14: 27-37.

Lake Hill, one of the seven peaks of Mont St. Hilaire, has a major north-south orientation. The forest is closed-crown deciduous with maple, beech and oak comprising the main tree types. The trees average 3 m higher on the north slope than on the south and give greater crown coverage on the forest floor, the foliage below the 6 m level being more luxuriant on the north slope. The soils on Lake Hill are residual; they have a sandy or gravelly-loam texture and are quite stony and shallow. The average depth to the bedrock surface at measuring plots along a north-south transect was 65 cm.

The latent heat used in evapotranspiration from forested hill slopes at Mont St. Hilaire is linearly related to net radiation for measurement intervals of two weeks. There is less evapotranspiration per unit of radiant heat input from south-facing than from north-facing slopes, which is attributable to a soil moisture deficit on south slopes. The evapotranspiration from the north exposures proceeded at its potential rate and satisfied the same linear relation to net radiation as did data for non-sloping surfaces at experimental sites in Canada, the United States, and Australia.

Sackeyfio, H.W. 1964. Rainfall and runoff relations of Lake Hertel, Mont St. Hilaire, Québec. M.Eng. Thesis, Department of Civil Engineering, McGill University, Montreal, Québec. 114 pages.

This is a continuation of Goswami's (1962) study on the hydrologic regime of Lac Hertel. A positive correlation is established between meteorological data collected at the McGill University campus and at Mont St. Hilaire: the McGill observatory adjusted data should be considered applicable to Mont St. Hilaire. The average runoff coefficient calculated from observed data of unit hydrographs for the period July 1st to August 30,

1963 was found to be 0.0460. The runoff coefficients varied between a low of 0.0056 (1962) to a high of 0.0776 (1963). A positive correlation existed between rainfall and runoff, with a correlation coefficient of +0.99. A positive correlation between total inflow and inflow from the west basin was found to be +0.88. Annual loss of evaporation from the water surface of Lac Hertel was 1045 mm compared with 1038 mm in 1961. Total evaporation from the water surface for July and August 1963 was 184 mm. Values for annual evapotranspiration were estimated to be 564 and 607 mm using two different formulas (Meyer's base curve, and Lowry and Johnson's formula, respectively).

Singh, Bhwan. 1976. The effect of intercepted rainfall on evapotranspiration rates over a mixed hardwood forest in southern Québec. Ph.D. Thesis, Department of Geography, McGill University, Montreal, Québec. 156 pages.

The effect of intercepted rainfall on the water balance was evaluated on the gently sloping southern base of Lake Hill and a small tributary basin of West Creek. The following precipitation measurements were taken: open, throughfall, stemflow, and interception. Runoff, soil moisture, radiation, leaf area, and leaf wetness were also measured. Evapotranspiration was modelled and estimated.

Under the same weather conditions, and assuming a dry canopy, the rate of evaporation of intercepted rainfall would be several times that of the transpiration of soil water, even when soil moisture is non-limiting. About 70 percent of intercepted rainfall is lost to the soil beneath, and 30 percent goes toward conserving the transpirational withdrawal of soil moisture. The evaporation of intercepted rainfall can be viewed as more of a direct loss of moisture to soil water depth, than of a saving to the transpirational withdrawal of soil moisture.

Singh, Bhwan. 1977. The effect of rainfall characteristics and post-wetting synoptic conditions on evaporation rates from a wetted hardwood canopy. McGill University Climatological Bull. 21: 12-33.

At Mont St. Hilaire approximately 20-30% of total precipitation is intercepted by trees for rainfalls greater than 5 mm. Below 2.4 mm all of the precipitation is intercepted. However, the effect of rainfall characteristics and post-wetting weather condition is critical to the nature and magnitude of intercepted rainfall: amount, duration, intensity, and time of occurrence regulated the amount of evaporation during wetting and hence total interceptional loss. The rate and efficiency of water loss from a wetted canopy is controlled by post-wetting weather.

Singh, Bhwan, and G. Szeicz. 1979. The effect of intercepted rainfall on the water balance of a hardwood forest. Water Resources Research 15: 131-138.

The rate of evaporation of intercepted rainfall from the hardwood canopy of Mont St. Hilaire is several times the transpiration rate that would occur if the canopy were dry in the same weather conditions. When a wet canopy and a dry canopy are compared separately, the rate of evaporation in the presence of intercepted rainfall considerably exceeds the transpiration rate from a dry canopy, even though radiative and ambient air conditions were more favourable for latent heat transfer during the dry period. Furthermore, during the majority of instances, when the canopy is wet, the rate of evaporation exceeds the net radiation supply. Thus when the forest is wetted by intercepted rainfall, it probably becomes a strong sink for advected energy, which may come either from the sensible heat content of the overflowing air or from the heat stored in the canopy space itself.

Singh, Bhwan, and John E. Lewis. 1980. Appauvrissement de la couche neigeuse en hiver dans une forêt de feuillus, Mont St. Hilaire, Québec. Géographie Physique et quaternaire 34(2): 247-251.

Field measurements were taken on Pain de Sucre in winter 1977-78 in order to gauge the amount of snow removed by the creation of doughnut-shaped depressions around the trunk of hardwood trees. About 2.6% of a snowpack 61 cm deep is replaced by these doughnut-shaped holes, and a further 1.3% is occupied by trunk space. The errors produced by these holes in the snowpack further adds to the error limits in the measurement of snow precipitation, especially in large basins.

Wilson, Richard G. 1967. Notes on radiation and sunshine at Mont St. Hilaire, Part a. McGill University Climatological Bull. 1: 17-19.

Wilson, Richard G. 1968. Topographic influences on a forest microclimate. M.Sc. Thesis, Department of Geography, McGill University, Montreal, Québec. 208 pages.

Wilson, Richard G. 1970. Topographic influences on a forest microclimate. McGill University Climatological Res. Ser. No. 5. 109 pages.

This study was done on Lake Hill, which has nearly symmetrical north- and south-facing slopes; the north slope forms part of the interior basin of the mountain and rises sharply away from Lac Hertel; the south slope is an exterior slope of the mountain. Both slopes of Lake Hill have an average inclination of 23°. The north slope always received less solar radiation than horizontal surfaces, and the south slope received more solar radiation than the north slope. Net radiation on the south slope was 3 percent more than horizontal surfaces during the period April 19 to September 22; during the same interval, the north slope net radiation was 79% of the horizontal surface.

The total rainfall for the summer (April 19-September 22, 1968) was 39.8 cm. From a total soil column of 65 cm, the north slope plots had an average of 51 cm of soil which could hold water, the horizontal plots had an average of 48 cm, and the south slope plots had an average of 40 cm. Average values for evapotranspiration were 53, 45, and 46 cm for the north, horizontal, and south slopes, respectively. Soil temperatures at all depths were consistently higher on the south slope; this difference was particularly relevant at the end of April when the south slope surface soils had a temperature of 5°C while those on the north slope were frozen. The greatest difference in soil temperature occurred during the leaf-bare periods, particularly in the spring when the temperature at 2 cm was 6.6°C higher on the south side at the beginning of May; this large soil temperature difference is attributable to the much greater evaporation from the soil surface and the smaller amount of solar radiation reaching the ground surface on the north slope. Average differences in maximum temperature between the north and south slopes for the snow cover period, spring leaf bare period, and full leaf periods were 2.5°C, 2.6°C, and 1.2°C higher on the south slope, respectively. Only slight differences in minimum temperatures were found during all periods, with the average south slope minimum being 0.5°C higher than that on the north.

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* **CLIMATOLOGY** *
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Anonymous. 1967. Mont St. Hilaire - selected climatic data. McGill University Climatological Bulletin 1: 22-24.

Anonymous. 1967. General climatic data for Mont St. Hilaire. McGill University Climatological Bulletin 2: 51-56.

Baird, P.D. 1967. Mont St. Hilaire Climatological Records. McGill University Climatological Bulletin: 9-14.

Average records of temperature and precipitation taken on Mont St. Hilaire between 1960 and 1966 are given below:

	Mean temp. (°C)	Mean rain-fall (mm)	Mean snowfall (mm)	Total precipitation (mm rain or equivalent)	No. of days with measurable precipitation	No. of days with thunder-storms
Jan.	-10.6	20.8	553.7	76.2	16	-
Feb.	- 9.5	20.8	579.1	78.5	15	-
March	- 3.1	23.4	442.0	67.6	12	-
April	4.4	61.9	187.9	80.8	14	1
May	12.6	61.5	63.5	67.8	14	3
June	17.4	69.6	-	69.6	11	6

	Mean temp. (°C)	Mean rain-fall (mm)	Mean snowfall (mm)	Total precipitation (mm rain or equivalent)	No. of days with measurable precipitation	No. of days with thunder-storms
July	19.1	102.3	-	102.4	13	8
Aug.	17.8	127.2	-	127.5	15	6
Sept.	13.8	78.7	-	78.7	11	2
Oct.	8.3	76.7	45.7	81.3	13	1
Nov.	1.7	67.8	233.7	91.2	15	-
Dec.	- 7.3	23.9	604.5	84.3	21	-
Year	5.4	734.1	2712.7	1005.3	169	27

Baird, P.D. 1970. The climate of Mont St. Hilaire - a personal impression. McGill University Climatological Bulletin 8: 26-39.

Enright, Neal J., and John E. Lewis. 1985. Aspect-related vegetation patterns and climate at Mont St. Hilaire, Quebec. Canadian Geographer 29: 249-256.

Reanalysis of unpublished data from Cook (1971), Phillips (1972), Wilson (1970), Rouse (1970), and Rouse and Wilson (1969) helped elucidate the microclimatic basis for aspect-related differences in forest composition on Mont St. Hilaire. The high tree diversity and low woody biomass of south and west slopes versus north and east slopes correlates maximally with differences in radiation and evapotranspiration in spring and fall. The south and west slopes have higher rates of insolation and evapotranspiration compared to the north and east slopes.

Garnier, Benjamin J. 1968. Estimating the topographic variation of direct solar radiation: a contribution to geographical microclimatology. Canadian Geographer 12: 241-248.

This article includes direct radiation maps of Lac Hertel for December 27, 1966, and June 20 and September 19, 1967.

Garnier, Benjamin J., and Atsuma Ohmura. 1968. A method of calculating the direct shortwave radiation income of slopes. Journal Applied Meteorology 7: 796-800.

Garnier, Benjamin J., and Atsuma Ohmura. 1970. The evaluation of surface variations in solar radiation income. Solar Energy 13: No. 1: 21-34.

Lafleur, Daniel. 1969. La distribution topographique du rayonnement solaire au Mont St. Hilaire pour la période estivale de 1968. McGill University Climatological Bulletin 6: 44-58.

Ohmura, Atsuma. 1967. Correlation of solar radiation and sunshine duration for station Mont St. Hilaire, October-December, 1966. McGill University Climatological Bulletin 1: 19-21.

Ohmura, Atsuma. 1968. The computation of direct insolation on a slope. McGill University Climatological Bull. 3: 42-53.

The direct insolation on June 20, 1967, which approximates the summer solstice, shows the most uniform distribution over the rugged ground surface of Mont St. Hilaire. On September 19, 1967, large differences were found in direct insolation, with maximum values found on a relatively steep (40-50°) south slopes, whereas in summer the highest values appeared on a more gentle (10-15°) slope. At the winter solstice, the relative difference between north and south slopes is similar to that of September, but the magnitude is much less.

Ohmura, Atsuma. 1969. Computation and mapping the short-wave radiation on a slope. M.Sc. Thesis, Department of Geography, McGill University, Montreal, Québec. 144 pages.

Global radiation maps of Mont St. Hilaire are given for 12 months (of 1966) illustrating the topographic influence on radiation distribution. Topographic influence is most pronounced between north and south-facing slopes, particularly during the spring and fall. In the summer, the global distribution shows the most uniform distribution over the rugged surface of Mont St. Hilaire. Global radiation maps for Lac Hertel and Pain du Sucre are also given.

Ohmura, Atsuma. 1970. The influence of the sky-line on the incidence of direct short-wave radiation. McGill University Climatological Bulletin 7: 17-24.

The latitude of Mont St. Hilaire (45°N) and the rugged topography (slopes 20-25°) have a negligible influence on the direct short-wave radiation received; however, when the sun's inclination is less than 20°, sky-line effects should be taken into account.

Ohmura, Atsuma, and Robert F. Fuggle. 1968. An experiment to measure the energy balance over short grasses in an orchard at Mont St. Hilaire, Québec. McGill University Climatological Bull. 4: 1-20.

A summary of 124 h of observations shows the following totals: net radiation = 1255 cal.cm^{-2} and soil heat flux = 85 cal.cm^{-2}. The latent and sensible heat fluxes calculated by using the Bowen ratio were 1132 cal.cm^{-2} and 46 cal·cm^{-2}, respectively.

Peterson, R.D. 1970. The spatial distribution of solar radiation in southern Québec: a progress report. McGill University Climatological Bulletin 7: 25-29.

Rouse, Wayne R. 1965. Aspects of a forest microclimate. Ph.D. Thesis, Department of Geography, McGill University, Montreal, Québec. 232 pages.

Surface cover of Mont St. Hilaire	Climate of Mont St. Hilaire
Maple forests: 15%	Annual mean temperature: 5.5°C
Maple beech forests: 16%	Extreme minimum temperature: -33.4°C
Maple oak forests: 28%	Extreme maximum temperature: 36.1°C
Scrub oak forest: 14%	Maximum possible temperature range: 69.5°C
Hemlock & pine forest: 5%	Earliest date of last spring frost: March 28
Wet, rocky, burned, and disturbed sites: 18%	Latest date of last spring frost: May 24
Lake Hertel: 4%	Latest date of first fall frost: Nov. 9
	Earliest date of first fall frost: Sept. 29
	Maximum possible frost free period: 216 days
	Minimum possible frost free period: 128 days

This study, done on the south slope of Lake Hill, around Lac Hertel, on the north slope of Burned Hill and along West Creek, examines the forest microclimate of Mont St. Hilaire. Approximately 60 percent of the net radiation was concentrated within the top 3 m of the canopy on the north and south slopes; net radiation was somewhat higher at greater depths within the forest of the south slope. Net radiation was greater at lower heights on both slopes during periods of mainly diffuse solar radiation. Considerably more incoming radiation and hence higher net radiation is received per unit area on south-facing than on north-facing slopes. The forest minimizes the topographical influences on microclimate, particularly during the growing season; even during the dormant period, the leaf litter dampens the movement of heat and water within the soil.

The amount of water which was intercepted by the forest crown was a linear-function of the total rainfall until a maximum weekly rainfall of over 4 cm was reached. Stemflow proceeded on the smooth-barked beech trees for all rain amounts greater than 0.4 cm, but for maple trees it did not start until the total rainfall exceeded 0.7 cm. Underground runoff from the forest floor decreased regularly throughout the growing season. Surface flow, however, responded to a number of influences. Of the total rainfall during the period of active growth for this deciduous forest (May 1 -

October 1), the tree crowns intercepted 29%, 1% reached the forest floor as stemflow, and 70% penetrated to the ground as throughfall. Runoff from the forest amounted to 12% of the total rainfall. A soil moisture capacity of 15 cm was estimated for Mont St. Hilaire.

Rouse, Wayne R., and R.G. Wilson. 1969. Time and space variations in the radiant energy fluxes over sloping terrain and their influence on seasonal heat and water balances at a middle latitude site. Geografiska Annaler 51 (Ser. A): 160-175.

Maps of global and direct solar radiation of Lake Hill are given by season. The greatest slope differences in global radiation occur in the fall and winter, whereas in summer, variations due to exposure are minimal. Cumulative evapotranspiration over the growing season shows little difference between north and south slopes although substantial differences were noted before leaf development. Differential snow melt leads to complete snow removal from south slopes three weeks in advance of those facing north. As a result, north slope soils have stored 50% more water by early spring than their southern counterparts. Trend surface analysis shows that the spatial distribution of surface soil moisture exists in early spring and persists for at least three months. The greater consumption of available heat for evapotranspiration from north-facing sites results in lower air and soil temperatures than on south-facing sites.

Singh, Bhwan. 1976. Wind profile estimates for a hardwood forest. McGill University Climatological Bulletin 19: 17-22.

Wilson, R.G., and D.E. Petzold. 1972. Daily solar radiation differences between stations in southern Canada: A preliminary analysis. McGill University Climatological Bulletin 11: 15-22.

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* GEOLOGY *
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Adams, Frank D. 1903. The Monteregian Hills: a Canadian geographical Perspective. Journal of Geology 2: 239-282.

Adams, Frank D. 1913. The Monteregian Hills. International Geological Congress, Guide Book #3, pp. 29-80. Geol. Surv. Canada, Ottawa.

Anonymous. 1969. Geology and mineral resources of Québec. Québec Department of Natural Resources, Québec, 17 pp.

Clark, T.H. 1955. Région de St. Jean-Beloeil. Ministère des Mines, Rapport Géologique 66, Québec. 92 pp.

The underlying geology of the St. Lawrence Lowlands surrounding Mont St. Hilaire is given including comment on the area's stratigraphy, igneous rocks, tectonics, historical geology, and applied geology.

Currie, K.L. 1976. The alkaline rocks of Canada. Geol. Surv. Canada Bull. 239: 50-52.

Mont St. Hilaire is generally considered one of the keys to understanding the petrology of the Monteregian Hills because it displays the typical mafic suite, as well as syenitic rocks in close contact. The pluton is shaped like a crude figure-of-eight, with the axis east-west. The western, gabbroic part of the intrusion is composed of concentric rings of steeply dipping layered gabbro and diorite, whereas the eastern half of the pluton consists of a zoned phonolitic mass, locally showing prominent flow texture, characterized by an enormous number of inclusions. The mafic part of the pluton grades from melanocratic varieties at the centre to less melanocratic gabbro at the margin. Includes geologic map after Poulliot (1969).

Dawson, J.W. 1878. Remarks on the geology of Beloeil Mountain and vicinity. Canadian Naturalist News Service 8: 286-288.

Dresser, John A., and T.C. Denis. 1944. Geology of Québec. Vol. II, Geol. Report 20, Dept. of Mines, Québec. Redemti Paradis, Québec, 544 pp.

Mont St. Hilaire, rising 412 m above sea level, has an igneous core formed from two major intrusions: essexite, the earlier of the two, forms the western half of the mountain, and a porophyritic nepheline syenite the eastern half. The typical essexite contains about 55% plagioclase, 19% augite, hornblende, biotite, and small amounts of olivine or nepheline. The nepheline-sodalite syenite is composed of large crystals of feldspar and feldspathoids, including orthoclase and albite. The nepheline syenite has a strong development of breccia about its borders; most of the fragments are hornfels, marble, or essexite, but there are also some camptonite and tinguaite dykes and sheets which cut the essexite and adjacent hornfels in places.

Ells, Robert W. 1896. Report on a portion of the Province of Québec. Ann. Report of Geological Survey of Canada, Vol. VII, part j, 1894.

Fairbairn, H.W., G. Favre, W.H. Pinson, P.M. Hurley, and J.L. Powell. 1963. Initial Sr^{87}/Sr^{86}, whole rock age, and discordant biotite in the Monteregian igneous province, Québec. U.S. Atomic Energy Commission. Report 11: 105-110.

The age of Mont St. Hilaire essexite is estimated to be 99.5 ± 4 million years, using isotopic ratios of Sr^{87}/Sr^{86}.

Fairbairn, H.W., G. Favre, W.H. Pinson, P.M. Hurley, and J.L. Powell. 1963. Whole-rock age, and discordant biotite in the Monteregian igneous province, Québec. Journal Geophysical Research 68: 6515.

Gendreau, H.W. 1949. Québec's Monteregian Hills. Canadian Geographical Journal 32(3): 108-117.

Gold, David P. 1963. The relationship between the limestones and the alkaline igneous rocks of Oka and St. Hilaire, Québec. Ph.D. Thesis, Department of Geology, McGill University, Montreal, Québec. 354 pages.

Mont St. Hilaire is divided topographically and petrologically into an eastern predominantly syenitic mass and a western predominantly gabbroic mass. The gabbroic rocks occur as massive rocks in the western half, and as xenoliths in syenitic rocks in the eastern half. The limestones and marble exposed at Mont St. Hilaire are xenoliths of sedimentary limestone in syenitic rocks.

The five main phases of gabbroic rocks recognized are: 1) Perknite, which includes varieties from olivine perknite to feldspathic perknite, with minor amounts of pyroxenite and rocks in metallic oxides; 2) Coarse-grained porphyritic titanangite, gabbro with large roughly aligned lath-like feldspar phenocrysts; 3) titanaugite gabbro, which grades into alkali-rich varieties and essexite; 4) feldspathic essexites are the most abundant of the gabbroxic rocks and constitute the outer zone; 5) rouvillite - a feldspathoidal-rich rock, which occurs locally in the feldspathic essexites.

In the syenitic suite, a wide variety of syenitic rocks are exposed, and include equigranular nepheline syenites, sodalite syenites, porphyritic syenite and trachytic breccias. They are all silica deficient types and only rarely is any free quartz present. The following breakdown sequence is suggested: 1) nepheline-sodalite syenite porphry, and nepheline syenite porphry. These are the most common of the syenitic rocks and exhibit a well developed trachytic texture; 2) igneous breccia - a porphyritic trachyte with variable amounts of inclusions (probably of late phase of the syenite porphyry); 3) feldspathic tawite - a medium- to coarse-grained sodalite rich syenite; 4) syenite - equiangular syenite and sodalite syenite.

A number of dykes and sheets are exposed, cutting the igneous rocks of Mont St. Hilaire and the sedimentary rocks in the immediate vicinity. They

include such rock types as diabase (essexite), tinguaite, nepheline syenite, camptonite, trachyte, albitite, andesine porphyry, and aplite. Some of the best exposures of dyke rocks are seen on the Yellow trail which leads from Lac Hertel to Pain du Sucre.

The major geochemical constituents of Mont St. Hilaire rocks include: silica, titania ($Ti\ O_2$), alumina, iron, magnesia, lime, soda, potash, and phosphorous. The minor constituents and trace elements include: barium, strontium, rubidum, manganese, niobium, zirconium, cerium, lanthanium, neodynium, yttrium, gallium, scandium, nickel, cobalt, chromium, molybdenum, tin, copper, and boron.

Gold, David P. 1967. Alkaline ultrabasic rocks in the Montreal area, Québec. In Ultramafic and related rocks. Edited by P.J. Wyllie. Wiley, New York, pp. 288-302.

Graham, R.P.D. 1944. The Monteregian Hills. Geology of Québec, Vol. II. Descriptive Geology, Québec, Dept. of Mines, Geological Report 20: 455-482.

Greenwood, Richard Charles. 1983. Petrogenesis of the Gabbroic Suite, Mont St. Hilaire, Québec. M.Sc. thesis, Department of Geology, Univ. of Western Ontario, London, Ontario. 193 pages.

Mont St. Hilaire is a member of a Lower Cretaceous Monteregian alkaline province of Québec. The intrusion consists of a western gabbroic suite and a later, eastern nepheline syenite body. The gabbros at Mont St. Hilaire possess a well developed, concentric foliation, which dips inwards, at an average angle of 60°, towards a common focus. Intrusive contacts are developed between a number of rock types in the suite, and suggest that the gabbros were intruded in at least two stages. The leucogabbro, foliated gabbro and kaersutite-biotite gabbro were intruded first, followed by the kaersutite gabbro, and gabbro-melagabbro series. Olivines from the gabbroic suite show progressive enrichment in MnO with increasing fayalite content, and are enriched in MnO relative to those from non-alkaline types. Clinopyroxene is Ti rich salite and shows a linear relationship between Ti and Al^{IV}. From whole rock and mineral analyses the author suggests that the gabbroic suite was formed by fractional crystallization of an evolved alkali basalt under conditions more oxidizing than the quartz-fayalite-magnetite buffer. The gabbroic suite probably has a funnel shape, formed by passive intrusion and inflation within the sedimentary strata.

Hodgson, Charles J. 1969. Monteregian Dike Rocks. Ph.D. thesis, Department of Geology, McGill University, Montreal, Québec. 168 pages.

Hunt, Sterry. 1860. On some igneous rocks of Canada. Amer. Jour. of Science 29: 282-284.

Kapp, H.E. 1961. A petrographic comparison of a tertiary alkaline igneous complex in Northeastern Greenland with the Monteregian Hills of Eastern Canada. Canadian Mineralogist 6: 582-594.

Keek, J. 1915. Preliminary report on the clay and shale deposits of the Province of Québec. Geological Survey Canada, Manual 64, Ottawa. 280 pages.

Klugman, M.A. 1953. A study of post-pleistocene deposits around Mounts St. Hilaire, St. Bruno, Johnson and Rougemont, Québec. M.Sc. thesis, Department of Geology, McGill University, Montreal, Québec. 103 pages.

A portion of the area around Mont St. Hilaire is covered by superficial deposits of sand from the Pleistocene and Post-Pleistocene age. On the mountain proper the sand deposits are a result of wave action from the Champlain Sea, which left a series of terraces. On the surrounding plain sand deposits were a result of marine sedimentation. Analyses of these sands indicate that the heavy minerals came from a location outside the Monteregian province, likely the Grenville province to the south; however, Mont St. Hilaire has also made a small contribution to the formation of the sand deposits.

Larochelle, André. 1962. Paleomagnetism of the Monteregian Hills, south-eastern Québec. Geological Survey Canada Bulletin, 79, Ottawa. 44 pages.

Larochelle, André. 1969. Paleomagnetism of the Monteregian Hills: further new results. J. Geophys. Res. 74: 2570-2575.

The paleomagnetic declination (D) and inclination (I) in degrees for Mont St. Hilaire is given. Mean declination and inclination for all the Monteregian Hills are 157.4° and -59.9°, respectively. This article reconfirms that the earth's magnetic field polarity reversal occurred about the time the Monteregian Hills were formed (Lower Cretaceous).

Lasalle, Pierre, and John A. Elson. 1962. Preliminary report on Beloeil area surficial geology. Quebec Department of Natural Resources, Preliminary Report 497, Québec. 10 pages.

The Beloeil area, in the St. Lawrence Lowlands, is a broad plain developed on relatively undeformed rocks of early Paleozoic age. The Lowlands were flooded by the late Pleistocene Flandrian transgression of the

Champlain Sea, and a thick mantle of marine sediments conceals most of the bedrock surface. The area is drained toward the north by the St. Lawrence and Richelieu Rivers, most of the small streams follow former sub-parallel channels abandoned by the early St. Lawrence and Richelieu Rivers. The pleistocene deposits of the area are subdivided into two groups: those of Wisconsin age and earlier, and those of recent age. A description of the deposits include till (interbedded silts and clay, reddish brown sands), Champlain Sea clays, Champlain Sea gravels and sands, High Terrace Sands, and Low Terrace Sands.

MacPherson, Joyce. 1964. Raised shoveling and drainage evolution in the Montreal lowland. Cahiers de Géographie, pp. 343-360.

Comprehensive summary of postglacial drainage patterns including the recessional stages of the Champlain Sea and the development of the Richelieu River. The highest beach left on Mont St. Hilaire by the Champlain Sea was at 178.5 m.

MacPherson, Joyce. 1966. The post-Champlain evolution of the drainage pattern of the Montreal lowland. Ph.D. Thesis, Department of Geography, McGill University, Montreal, Québec. 265 pages.

O'Neill, J.J. 1914. St. Hilaire (Beloeil) and Rougemont Mountains, Québec. Canada Dept. Mines, Geol. Surv. Memoir 43, No. 36 Geol. Series, Ottawa. 110 pages.

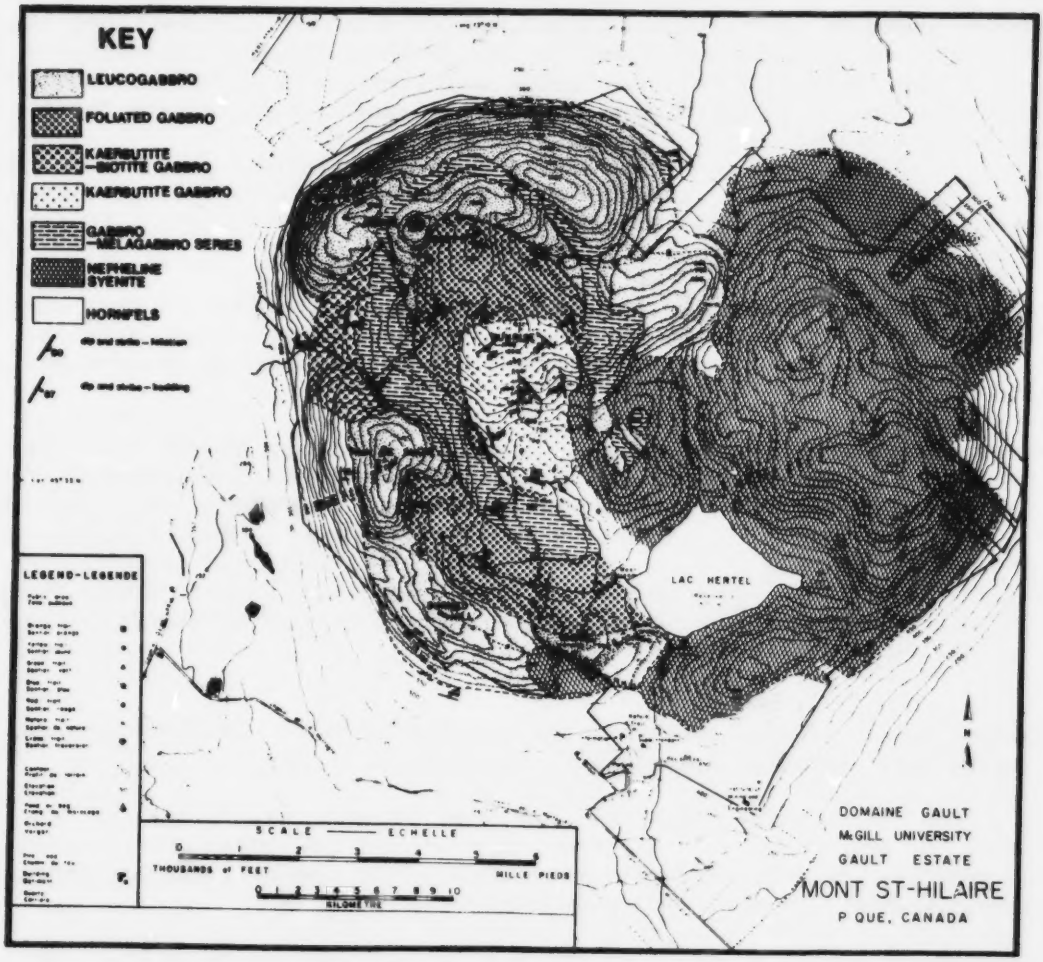
Philpotts, A.R. 1967. Mechanism of emplacement of the Monteregian intrusions. Canadian Mineralogist 10: 395-410.

Provides a summary comparison of the primary mineralogy of the intrusions forming Mont St. Hilaire compared to the other Monteregian Hills. Mont St. Hilaire differs substantially from the neighbouring Monts St. Bruno, Rougemont, and St. Grégoire (Johnson).

Pouliot, Gaston. 1962. The thermal history of the Monteregian intrusives based on a study of the feldspars. Ph.D. Thesis, Department of Geology, McGill University, Montreal, Québec.

The Monteregian Hills intrusives are typical igneous masses of the epizone. Their definite magmatic origin and their unmetamorphosed rock assemblages render them particularly well suited for studies on mineral equilibria and polymorphic phenomenon in rock-forming minerals. The Monteregian rocks are conveniently subdivided into two rock series, the Monteregian-essexites and the syenite rocks. Mont St. Hilaire essexites differ from other Monteregian essexites in their mineralogical composition.

Geological map of Mont St. Hilaire from Greenwood (1983)



Feldspar concentrations were obtained from specimens of Mont St. Hilaire essexites; these rocks were holocrystalline, massive and generally medium-grained and very similar to those from Mont Rougemont. The principal mafic minerals found in these rocks were titaniferous augite and red-brown hornblende; optically negative olivine is generally present in accessory amounts in most specimens of St. Hilaire essexites (rouvillite). The mean mineralogical composition of rouvillite is 55% plagioclase, 15% alkali feldspar, 12% pyroxene, 7% nepheline, 3% biotite, 3% hornblende, 3% iron ore, 1% apatite, 1% olivine, and a trace of sodalite.

Pouliot, Gaston. 1969. Notes on the geology of Mont St. Hilaire. In Guidebook for the Monteregian Hills. Edited by G. Pouliot. GAC-MAC Annual Meeting - June 5-7, 1969. Mineral Association of Canada, Montréal, pp. 93-102.

Mont St. Hilaire, a steep-sided hill that rises some 420 m above sea level, is a small igneous pluton of Monteregian Hill age (99.5 myr) that pierced through the flat lying Lower Paleozoic rocks of the St. Lawrence Lowlands. The pluton is semicircular in plan and measures about 880 hectares in area; it can be divided into a western half, made up of older and predominantly basic and mafic rocks, and an eastern half composed of younger nepheline syenite and related intensive breccia and porphyries.

The basic, mafic, and intermediate rocks that constitute the western half, have generally been referred to as essexites. The rocks vary in composition from olivine-rich, and/or pryroxene-rich rocks to feldspathic and nepheline-bearing types; in texture they vary from medium-grained equigranular to porphyritic types. The syenite rocks that constitute the eastern half of Mont St. Hilaire are predominantly lime-poor feldspathic rocks of varying nepheline and sodalite content; in places, they are rendered heterogeneous due to the presence of inclusions of earlier rocks, comprising pyroxemites, gabbros, essexites as well as hornfels and recrystallized limestones of Ordovician and Lower Devonian age.

The country rocks enclosing the igneous rocks at the present erosion level consist of calcareous shale, siltstone, and limestone of Upper Lorraine and Lower Richmond groups. Except for the immediate 15 to 30 m of rock adjacent to the contact with the intensive where the strata have been tilted inward towards the intensive at dips of up to 50 degrees, the country rocks have been undisturbed and lie more or less horizontally with dips varying from 0-6 degrees. The contact aureole surrounding the igneous mass is relatively narrow, less than 170 m.

Dykes and sills associated with the igneous mass invade all the igneous rocks and hornfels on the mountain. The principal dykes observed are camptonite, lamprophyre, tinguaite, diabase, nepheline syenite, and albitite. A thin leucocratic granitic dyke has been observed in the quarries. Tinguaite dykes have been found cutting the aegirine pegmatite in the quarries; tinguaite dykes are possibly the youngest igneous rocks on the mountain.

Rajasekaran, Konnur Chandrasekaran. 1968. The petrology of the nepheline syenites at Mont St. Hilaire. Ph.D. Thesis, Department of Geology, McGill University, Montreal, Québec. 226 pages.

By mapping and from a study of the several members of the nepheline syenite complex, their nature and distribution, structure, manner and order of intrusion, and effects on the country rocks, the author concludes that the area around Mont St. Hilaire is one of cauldron subsidence. Besides a routine identification of the essential and accessory minerals of the various rock types, nine pyroxenes were analysed and their analyses reveal that the distribution of Al^4 in the structure increases with the basicity, and that the distribution of ZrO_2 increases with the acidity of rocks. The chemical, optical, and X-ray data for narsarsukite are given, and its origin as due to soda metasomatism of hornfels rock is established. The structure, crystallization-differentiation, volatilization, and metasomatism have all played a major part in the evolution of these rocks.

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* MINERALOGY *
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Boissonnault, Jean, and G. Perrault. 1965. Eucolite from St. Hilaire, Québec. Canadian Mineralogist 8: 393.

Eucolite from Mont St. Hilaire occurs in pegmatites within the Monteregian alkaline intrusive and corresponds approximately to the chemical formula $(Na, Ca, Ce)_6ZrSi_6O_{18}(OH,Cl)_2$. Refractive index for Na light is 1.622; it is weakly birefringent. Twinning is frequent although it is not readily apparent in thin sections. The mineral is reddish-brown in colour; hardness is 5 to 6. Density is 3.01 g/cm^3. Differential thermal analysis shows a small exothermic peak at 890°C and a larger asymmetric endothermic peak at 1050°C; the melting point of the mineral had not been reached at 1100°C.

Chen, T.T., and G.Y. Chao. 1974. Burbankite from Mont St. Hilaire, Québec. Canadian Mineralogist 12: 342-345.

Burbankite occurs as small colourless, yellow or pink, dihexagonal prismatic crystals embedded in analcime or natrolite in the miaroles and pegmatite dikes in nepheline syenite on Mont St. Hilaire. It is commonly associated with microcline, aegirine and minor amounts of calcite, siderite and ancylite. The analysis calculates to $Na_{1.78}Ca_{1.42}Sr_{2.07}Ba_{0.48}RE_{0.10}(CO_3)_5$ with Z = 2, density (calc) = 3.50 g/cm^3.

Chen, T.T., and G.Y. Chao. 1975. Cordylite from Mont St. Hilaire, Québec. Canadian Mineralogist 13: 93-94.

Cordylite, $BaCe_2(CO_3)F_2$, from Mont St. Hilaire is associated with analcime, aegirine, albite and minor amounts of biotite, rinkite, calcite, apatite, catapleiite, pyrochlore and pyrophanite. The crystals are pale yellow with waxy luster on the crystal faces and vitreous luster on freshly exposed surfaces. The hardness is about 4½, density 3.97 g/cm^3. This mineral had not been found outside Greenland until discovered on Mont St. Hilaire.

Chen, T.T., and G.Y. Chao. 1980. Tetranatrolite from Mont St. Hilaire, Québec. Canadian Mineralogist 18: 77-84.

Tetranatrolite is a new name for "tetragonal natrolite", a mineral first reported from Ilimaussaw, Greenland. It is a widespread constituent in the pegmatitic dykes and miaroles in the nepheline syenite at Mont St. Hilaire, occurring most commonly as epitactic overgrowths on natrolite crystals and as small euhedral crystals or silky fibrous sprays on natrolite, analcime or microcline. It occurs less commonly as irregular earthy patches on natrolite or analcime. The mineral is white, translucent to opaque with vitreous to dull lustre. With D_{meas} 2.276 g/cm^3, we find Z = 4, whence D_{calc} = 2.234 g/cm^3. The analysis corresponds to $Na_2Al_2Si_3O_{10} \cdot 2H_2O$.

Chao, G., and A.W. Hounslow. 1966. Minerals from the Desourdy Quarry, Mont St. Hilaire, Québec. Canadian Mineralogist 8: 662-663.

Seventy-nine positively identified and ten unknown minerals from the nepheline syenite at the Desourdy Quarry, Mont St. Hilaire are briefly described. They are found (1) in veins showing no sign of alteration; (2) in highly altered veins; (3) in silicate vugs; (4) in carbonate vugs; (5) in inclusions type A (greyish green hornfels); (6) in inclusions type B (pectolite-calcite-amphibole association); and (7) in inclusions type C (calcite-vesuvianite-pyrite association).

Chao, G., D.C. Harris, A.W. Hounslow, J.A. Mandarino, and G. Perrault. 1967. Minerals from the Nepheline Syenite, Mont St. Hilaire, Québec. Canadian Mineralogist 9: 109-123.

Eighty-seven mineral species have been identified from the veins, vugs and inclusions in the nepheline syenite, Desourdy Quarry, Mont St. Hilaire. Many of these are rare minerals, found only in a few similar occurrences in the world. Chemical, optimal and crystallographic data on 10 unidentified minerals are also presented plus a table giving the six strongest diffraction lines and their intensities for all mineral species.

Chao, G. 1967. Leucophanite, elpidite and narsarsukite from the Desourdy Quarry, Mont St. Hilaire, Québec. Canadian Mineralogist 9: 286-287.

Leucophanite occurs in simple short prismatic to tabular pseudo-tetragonal crystals in the silicate vugs in nepheline syenite. It is usually associated with analcime and sodalite. The mineral is green and fluoresces pink in short wave ultraviolet. The powder diffraction is identical to that of the Norwegian crystal.

Elpidite was found as poorly formed prismatic crystals and fibrous aggregates in the altered silicate veins and vugs in nepheline syenite, frequently associated with microline, catapleiite, aegirine and calcite. On hand specimens it is white to very pale tan with a silky luster. Its powder diffraction pattern is identical to that of the Norwegian material but differs considerably from that of the material from Kola Peninsula, U.S.S.R.

Narsarsukite occurs as tabular tetragonal crystals with simple forms in the inclusions in the nepheline syenite. It was usually found associated with quartz and sometimes with leucophanite. The powder diffraction pattern of the St. Hilaire narsarsukite is identical to that of material from Greenland and Kola Peninsula, U.S.S.R.

Chao, G.Y. 1971. Carletonite, $KNa_4Ca_4Si_8O_{18}(CO_3)_4(F,OH)\cdot H_2O$, a new mineral from Mont St. Hilaire, Québec. American Mineralogist 56: 1855-1866.

Carletonite occurs in thermally metamorphosed inclusions in the nepheline syenite at Mont St. Hilaire. It is associated mainly with pectolite, albite, arfvedsonite, calcite, fluorite, and apophyllite.

The mineral is tetragonal, P4/mbm, with a = 13.178 ± .003 A, c = 16.695 ± 0.04 A, c/a = 1.2669. The strongest X-ray powder diffraction lines and their relative intensities (visual), are: 8.353 (100), 4.171 (100), 4.053 (50), 2.903 (90), 2.384 (60). Z = 4. Carletonite is pink to pale blue, with vitreous to pearly luster. II = 4-4½ on (001). Density (meas.) = 2.45 g/cm^3, (calc.) = 2.426 g/cm^3.

Chao, G.Y., and D.H. Watkinson. 1972. Leucosphenite from Mont St. Hilaire, Québec. Canadian Mineralogist 11: 851-860.

Leucosphenite occurs as small, colourless to pale blue, elongated tabular crystals and wedge-shaped crystals in the pegmatites and thermally metamorphosed inclusions in the nepheline syenite at Mont St. Hilaire. It is mainly associated with microcline, albite, aegrine, calcite, and quartz. Density = 3.065 (5) g/cm^3. Hardness = 6-6.5. Cleavages (010) and (001) are fair. An analysis calculates to $Na_{4.11}K_{0.12}Ba_{0.86}Ca_{0.01}Ti_{2.00}Nb_{0.06}B_{2.08}Al_{0.02}Si_{9.81}O_{30}$.

Chao, G.Y., D.H. Watkinson, and T.T. Chen. 1974. Hilairite, $Na_2ZrSi_3O_9\cdot 3H_2O$, a new mineral from Mont St. Hilaire, Québec. Canadian Mineralogist 12: 237-240.

Hilairite occurs as small, very pale brown, transparent crystals in miarolitic cavities and as flesh-pink porcelain-like opaque crystals in altered pegmatites in nepheline syenite at Mont St. Hilaire. The most abundant associated minerals are analcime, natrolite, microcline, catapleiite, elpidite, aegirine and chlorite. D(cal.) = 2.739 and D(meas.) = 2.724(4) g/cm^3. Hardness 4. No obvious cleavage was observed. The analysis corresponds to $Na_{1.85}K_{0.05}Ca_{0.02}$ $Zr_{1.03}$ $Si_{2.990_9}$: $3.21H_2O$ or ideally $Na_2ZrSi_3O_9$: $3H_2O$. Water in hilairite is zeolitic in nature; on heating hilairite loses all of its water at 220°C and at least 95% of the original water is recovered on cooling from 855°C to room temperature.

Chao, G.Y., and D.H. Watkinson. 1974. Gaidonnayite, $Na_2ZrSi_3O_9 \cdot 2H_2O$, a new mineral from Mont St. Hilaire. Canadian Mineralogist 12: 316-319.

Gaidonnayite occurs at Mont St. Hilaire in miaroles in nepheline syenite both as crystals on analcime and in cavities in dense natrolite aggregates; it is mainly associated with hilairite, aegirine, calcite, and siderite. Gaidonnayite also occurs in altered pegmatite dykes mainly with catapleiite, elpidite, hilairite, albite, microcline, chlorite, aegirine, epididymite, and goethite. The mineral is a dimorph of catapleiite and is similar in many properties to -catapleiite. Z = 4, D(calc) = 2.10, D(meas) = 2.67 g/cm^3, H = 5. It has conchoidal fracture and no noticeable cleavage. The mineral is colourless, white to beige, with vitreous luster. The analysis corresponds to $(Na_{1.72}K_{0.19})$ $(Zr_{1.00}$ $Nb_{0.09}Ti_{0.02})$ $Si_{2.88}O_9 \cdot 10H_2O$ or ideally $Na_2ZrSi_3O_9 \cdot 2H_2O$.

Chao, G.Y. 1978. Monteregianite, a new hydrous sodium potassium yttrium silicate mineral from Mont St. Hilaire, Québec. Canadian Mineralogist 16: 561-565.

The new mineral monteregianite occurs as needle-shaped crystals in radiating clusters and as groups of tabular crystals in miarolitic cavities, metamorphosed inclusions and rheomorphic breccias in the nepheline syenite at Mont St. Hilaire. The mineral is colourless, white, grey or rarely mauve or pale green with white streak and vitreous to silky lustre. Hardness 3½. An analysis corresponds to $(Na_{4.66}K_{1.80})$ $(Y_{1.68}Ca_{0.18}Mg_{0.06}$ $Ba_{0.04})$ $(Si_{15.87}Al_{0.16})$ $O_{38} \cdot 10.02H_2O$ or $(Na, K)_6$ $Y_2Si_{16}O_{38} \cdot 10H_2O$. Z = 4, D(meas.) 2.42, (calc.) 2.391 g/cm^3. TGA and DTG show three distinct stages of dehydration at 25-80, 80-200, and 200-400°C. Water in the mineral is zeolitic, and recoverable after heating to 650°C.

Chao, G.Y., P.R. Mainwaring, and J. Baker. 1978. Donnayite, $NaCaSr_3$ $Y(CO_3)_6 \cdot 3H_2O$, A new mineral from Mont St. Hilaire, Québec. Canadian Mineralogist 16: 335-340.

Donnayite occurs in pegmatite dykes, miarolitic cavities and interstices in nepheline syenite at Mont St. Hilaire. Usually associated with microcline, analcime, calcite, natrolite, chlorite, aegirine,

arfvedsonite and other minerals, donnayite commonly occurs in syntactic intergrowths with ewaldite, a Sr analogue of ewaldite, mekelveyite, and rarely with synchysite. Crystals of 0.05 to 2 mm vary in habit from platy, tabular, columnar, saucer-shaped, barrel-shaped to irregularly granular; they are usually pale yellow to yellow, but also colourless, white, grey, brown to reddish brown, with a white streak and vitreous lustre. Hardness = 3. D_{obs} = 3.30 and D_{calc} = 3.266 g/cm^3. Donnayite is isomorphous with weloganite (as shown by the following unconventional setting): triclinic P1, a 9.000, b 8.999, c 6.793A, a 102.77, β 116.28, Z = 1. An analysis corresponds to $Na_{0.93}(Ca_{0.87}Nd_{0.09}La_{0.03})(Sr_{2.95}Ba_{0.05})Y_{0.99}(CO_3)_6 \cdot 3H_2O$, or ideally $NaCaSr_3Y(CO_3)_6 \cdot 3H_2O$. New data show that mekelveyite is also triclinic, isomorphous with weloganite and donnayite; its original analysis may be recalculated to $(Na_{1.29}K_{0.02})(Ca_{0.73}U_{0.17})(Ba_{2.72}Sr_{0.17})(\ldots_{0.70}RE_{0.32})(CO_3)_6 \cdot 3.48H_2O$, close to $NaCaBa_3Y(CO_3)_6 \cdot 3H_2O$.

Chao, G.Y., and J. Baker. 1979. What's new from Mont St. Hilaire, Québec. Mineralogical Record 10: 99-101.

An updated list of recognized minerals from Mont St. Hilaire numbers 131 species and 22 additional unidentified minerals. Of the 51 additions to the list of minerals, Mont St. Hilaire is the type locality for the following seven: carletonite, donnayite, gaidonnayite, hilairite, lemoynite, monteregianite and yofortierite. A number of these 51 additions are rare minerals also found in similar alkaline rock occurrences in Greenland, the Kola Peninsula, USSR, and elsewhere. One of the more surprising minerals is wulfenite, which was found as yellow prismatic microcrystals in an alteration rim around galena. Brief descriptions of the 22 unknown minerals are given, including optical and crystallographic data.

Chao, G.Y. 1980. Paranatrolite, a new zeolite from Mont St. Hilaire, Québec. Canadian Mineralogist 18: 85-88.

Paranatrolite, a new zeolite from Mont St. Hilaire, is unstable in air and dehydrates to form tetranatrolite. Unaltered paranatrolite has been observed only as colourless transparent epitactic overgrowths on natrolite crystals preserved in water since the time of collection. Physical properties are: H = 5-5½, D(obs) = 2.21 g/cm^3; fracture conchoidal; cleavage unobserved. The powder pattern is similar to that of gonnardite. The chemical formula is that of tetranatrolite except for the water content, which is calculated from the mass-density-volume relationship: $(Na_{1.75}Ca_{0.10}K_{0.09})Fe_{0.01}Al_{1.95}Si_{3.02}O_{10} \cdot 2.98H_2O$ or, ideally, $Na_2Al_2Si_3O_{10} \cdot 3H_2O$.

Chao, G.Y., T.T. Chen, and J. Baker. 1980. Petarasite, a new hydrated sodium zirconium hydroxychlorosilicate mineral from Mont St. Hilaire, Québec. Canadian Mineralogist 18: 497-502.

The new mineral petarasite occurs as irregular grains in a xenolith in the nepheline syenite at Mont St. Hilaire. The xenolith is composed predominantly of biotite and microcline with minor amounts of catapleiite, apatite, zircon and other accessory minerals. The mineral is greenish yellow with white streak, transparent to translucent with vitreous lustre. Hardness 5-5½; fracture subconchoidal. Density 2.88(1)(meas.), 2.915 g/cm^3 (calc.). Electron microprobe analyses correspond to $(Na_{4.69}Ca_{0.13}K_{0.05})(Zr_{2.01}Ti_{0.01})Si_6O_{18}[(OH)_{0.60}Cl_{0.48}]\cdot 3.01H_2O$, whereas the ideal structural formula is $Na_5Zr_2Si_6O_{18}(Cl,OH)\cdot 2H_2O$, Z = 2. Excess water shown in the empirical formula is due to adsorbed water. TGA and DTG show two stages of weight loss at 25-830 and 830-1100°C. The mineral decomposes to parakeldyshite after heating to 1100°C. Infrared absorption spectra confirm the presence of structural and adsorbed water.

Chao, G.Y., and J. Baker. 1982. Nordstrandite from Mont St. Hilaire, Québec. 1982. Canadian Mineralogist 20: 77-85.

Nordstrandite $Al(OH)_3$ occurs as aggregates of tabular and blocky crystals in association with natrolite, tetranatrolite, analcime, sodalite, albite and microcline in pegmatites, miarolitic cavities and xenoliths in nepheline syenite at Mont St. Hilaire. Single-crystal X-ray-diffraction studies confirmed the triclinic symmetry of the mineral. The mineral is colourless, white and, rarely, beige, pink and pale green, transparent to translucent. Hardness 3, D(meas.) = 2.42 g/cm^3.

Gill, J.E., and D.P. Gold. 1962. Monts St. Hilaire and Johnson, Field Trip 8. 54th New England Intercollegiate Geological Conference Guide Book. Edited by T.H. Clark. McGill University, Montreal, Québec, pp. 67-79 (104 pages).

Mandarino, J.A., D.C. Harris, and J. Bradley. 1965. Magan-neptunite, epididymite and new species from Mont St. Hilaire. Canadian Mineralogist 8: 398.

Magan-neptunite, the manganese analogue of neptunite, occurs as simple, well-formed monoclinic crystals of prismatic habit elongated parallel to [001]. Most of the crystals are zoned; the inner portion is dark reddish brown, almost black, in large fragments, whereas the outer portions are yellow. The dark reddish brown material has Mn, Fe, and Zn and the yellow material has Mn, Zn, and Fe.

The new species is extremely widespread in its occurrence at St. Hilaire. It is present as well-formed single crystals and as intergrown radiating groups. Crystals are usually less than 2 mm in length. The mineral is pink to lilac, has a specific gravity of 4.15, and a perfect prismatic cleavage. Spectrographic (X-ray and emission) and other tests indicate that the mineral is a carbonate of Ca, Sr, and rare earths. The X-ray powder pattern is distinct from those of other chemically similar minerals.

Mandarino, J.A., and D.C. Harris. 1969. Epididymite from Mont St. Hilaire, Québec. Canadian Mineralogist 9: 706-708.

Two types of epididymite ($NaBeSi_3O_7OH$) have been identified at Mont St. Hilaire, one similar to a Czechoslovakian variety. It has a hardness of about 5½, a pronounced cleavage and a specific gravity of approximately 2.6. Some specimens were loose, others associated with serandite, analcime, albite, aegirine, eudialyte, and natrolite. Chemically this mineral is identical to eudidymite, but is crystallographically distinct.

Pendlebury, G.B. 1964. Catapleiite from St. Hilaire Mountain, Québec. Canadian Mineralogist 8: 120-121.

Catapleiite, a rare hydrous sodium-zirconium-silicate has been found as a result of recent studies of the mineralogy of a quarry in nepheline-sodalite-syenite at Mont St. Hilaire. The catapleiite occurs both in irregular pegmatitic veins and in a vug which was found during quarry operations in the syenite that forms most of the eastern half of this Monteregian intrusive. In the pegmatitic veins, the translucent catapleiite is a tan colour with a pearly luster and is found as plates up to 7 cm in width and 9 mm in thickness, enclosed for the most part in analcite and penetrated only by aegirine. These plates result from parallel growth of the catapleiite. In both occurrences, i.e. in the pegmatitic veins and the vug, the crystals are tabular parallel to the base and are usually bounded by the faces of two dipyramids. However, less frequently, prism faces are also observed.

Perrault, G., and J. Boissonnault. 1964. Serandite from St. Hilaire, P.Q. Canadian Mineralogist 8: 132.

Serandite from St. Hilaire has the following chemical composition: SiO_2 47.90%, Fe_2O_3 0.08%, FeO 0.86%, Al_2O_3 1.20%, MnO 33.8%, CaO 5.56%, MgO 0.03%, Na_2O 6.40%, K_2O 0.00, $H_2O^{-105°C}$ 0.20%, $H_2O^{+105°C}$ 2.42%, Y_2O_3 0.27%. X-ray diffraction data show that this mineral is a pectolite-type mineral. Serandite from Las Archipelago contained 28.99% MnO and 10.42% CaO, whereas serandite from Mont St. Hilaire is closer to the end with 33.8% MnO and 5.56% CaO.

Perrault, G., and G. Machairas. 1965. Catapleiite from St. Hilaire. Canadian Mineralogist 8: 398.

Catapleiite from St. Hilaire is hexagonal and dipyramidal. Optical properties for Na light are n_o = 1.588, n_o = 1.622. Uniaxial (+). Differential thermal analysis reveals that catapleiite from St. Hilaire on heating goes through a small endothermic reaction around 150°C, a more important endothermic reaction at 430°C, some slight exothermic readjustments around 580°C and an important endothermic reaction at 1000°C. Melting point had not been reached at 1100°C. Catapleiite from St. Hilaire

shows beautiful spiral growths. Anomalous 2V observed at the periphery of certain crystals may be related to dislocations.

Perrault, G. 1966. Polylithionite from St. Hilaire, P.Q. Canadian Mineralogist 8: 671.

Polylithionite from St. Hilaire has a chemical composition very close to that of the theoretical end member $K_2(Li_4Al_2)Si_8(OH,F)_4O_{20}$. Partial chemical analysis has given: SiO_2 60.7%; TiO_2 2.5; Al_2O_3 10.4; MgO 0.0; CaO 10.3; K_2O 11.9; Li_2O 7.5; total 93.3, volatile constituents yet to be determined. From single crystal X-ray diffraction studies: a = 5.3 A, b = 9.2 A, c = 10.2 A. One-dimension Fourier synthesis verified that polylithionite is isostructural with the 1 M polymorphic variety of sheet silicates (lepidolite is another example). Polylithionite appears to be fully tri-octahedral. Polylithionite occurs in vugs within pegmatite dykes associated with the nepheline syenite section of the St. Hilaire pluton.

Perrault, G. 1967. Preliminary note on the Mineralogy of Mont St. Hilaire, Quebec. Guidebook to the geology of parts of Eastern Ontario and Western Quebec, GAC-MAC 1967, Kingston, pp. 137-146.

This article briefly discusses petrology, mineral species and their manner of occurrence on Mont St. Hilaire.

Perrault, G., D.P. Gold, and M. Vallée. 1967. Mineralogy and petrology of alkaline rocks, Oka and St. Hilaire, Québec. Field Trip No. 7. In Guidebook - Geology of parts of eastern Ontario and western Québec. Edited by S.E. Jenness. GAC-MAC Kingston, Canada, pp. 335-341.

This includes information from a field trip to the mineral collecting sites on Mont St. Hilaire.

Perrault, G. 1969. Mineralogy at Mont St. Hilaire, Québec. In Guidebook for the Geology of the Monteregian Hills. Edited by G. Pouliot. GAC-MAC annual meeting, June 5,6,7, 1969, Mineral Association of Canada, Montreal, pp. 103-115.

Mineral collecting at De-Mix Quarry on Mont St. Hilaire was considerably intensified due to the discovery in 1963 of unusually beautiful specimens of serandite, the rare manganese analogue of pectolite. The crystals of serandite were remarkable for their size (up to 20 cm long) and for the variety of forms that they displayed: at least three new forms have been observed so far. The renewal of interest and activity led to the identification of 95 mineral species on the mountain, as well as 20 unidentified minerals that could constitute as many new mineral species. The rare minerals found on the mountain include the following: ancylite, astrophyllite, bastnäsite, catapleiite, elpidite, epididymite, eudialyte,

astrophyllite, bastnäsite, catapleiite, elpidite, epididymite, eudialyte, heluite, karpinskyite, lavenite, leifite, lemoynite, leucophanite, leucosphemite, neptunite, narsarsukite, polylithionite, pyrochlore, pyrophonite, ramsayite, rinkite, serandite, synchysite, and villiaumite.

Perrault, G., E.I. Semenov, A.V. Bikova, and T.A. Capitonova. 1969. La lemoynite, un nouveau silicate hydraté de zirconium et de sodium de St. Hilaire, Québec. Canadian Mineralogist, Vol. 9, pp. 585-596.

Lemoynite has the following chemical composition: SiO_2 47.32%, ZrO_2 23.23, TiO_2 0.43, Nb_2O_5 2.18, TR_2O_3 1.18, Fe_2O_3 1.61, MnO 0.10, CaO 5.06, Na_2O 4.75, H_2O 13.33, total 99.19. The following formula agrees with this analysis: $(Na, Ca)_3\ Zr_2Si_8O_{22}.8H_2O$. The five most intense lines on the x-ray powder pattern are: 8.01 A at 100, 3.562 A at 49, 2.807 A at 48, 9.0 A at 37 and 3.034 A at 33. Lemoynite occurs in pegmatites of the St. Hilaire alkaline massif; it probably belongs to the hydrothermal phase.

Perrault, G., and J.A. Mandarino. 1972. The Monteregian Hills: Mineralogy of Mont St. Hilaire. In International Geological Conference, 24th Session Guidebook B-15. Edited by J.E. Gill. pp. 1-12.

Perrault, G., and P. Richard. 1973. L'ekanite de Saint-Hilaire, P.Q. Canadian Mineralogist 11: 913-929.

Ekanite $(Th_{2-x}Na,Ca)_{4-y}\ K_{2-z}\ Si_{16}O_{40})$ from Saint-Hilaire has no crystalline cleavage, hardness of 5, and measured density 2.95. It is radioactive, giving and β particles but no observable radiation. The five principal peaks in the X-ray diffractogram are 3.38 (100), 3.32 (55), 5.30 (45), 2.64 (41) and 2.00 A (26). Data on ekanite from Saint-Hilaire agree more closely with those obtained on ekanite from Central Asia than with those obtained on ekanite from the original locality (Sri Lanka): the new data on ekanite from Saint-Hilaire are particularly interesting because type locality ekanite is metamict. Ekanite occurs in cavities in pegmatite veins in the nepheline syenite phase of the Mont Saint-Hilaire pluton; it is associated with nenadkevichite, analcite, and aegirine.

Perrault, G., Y. Harvey, and R. Pertowsky. 1975. La yofortierite, un nouveau silicate hydraté de manganèse de St-Hilaire, P.Q. Canadian Mineralogist 13: 68-74.

The chemical composition of yofortierite is SiO_2 48.44, MnO 28.41, MgO 2.35, Al_2O_3 1.49, ZnO 1.10, CaO 0.90, TiO_2 0.09, K_2O 0.05, Cr_2O_3 0.007, H_2O 17.22, total 100.057. The mineral occurs as radiating fibres in pegmatite veins of the Mont St-Hilaire nepheline syenite; it is associated with analcime, serandite, eudialyte, polylithionite, aegirine, altered microcline and albite. It is pink to violet. Hardness 2½, specific gravity 2.18. Most important peaks of x-ray powder diffractogram: 10.5 (100), 3.302 (90),

2.621 (30), 2.510 (20) and 4.14A (18). Yofortierite is the manganese analogue of palygorskite. The following structural formula is proposed for this mineral: $Mn_5 Si_8O_{20} (OH)_2(OH_2)_4 \cdot 4\text{-}5H_2O$.

Perrault, G., G.Y. Chao, and T.T. Chen. 1981. Additional data on petarasite from Mont St. Hilaire, Québec. Canadian Mineralogist 19: 411-413.

Peterson, R.C. 1983. The structure of hackmanite, a variety of sodalite, from Mont St. Hilaire, Québec. Canadian Mineralogist 21: 549-552.

The crystal structure of a photochromic variety of sodalite, known as hackmanite, was refined from MoKa(Zr) data in space group P43n [a 8.877(2) A]. The chemical formula is $Na_{7.50}Fe^{2+}_{0.05}[Si_{6.07}Al_{5.93}]O_{24}Cl_{1.99}(SO_4)_{0.01}$. In contrast to the results of an earlier refinement, the thermal parameters for the two tetrahedral sites are found to be similar. There is no evidence of tetrahedral cation disorder.

Rajasekaran, Konnur C. 1965. Narsarsukite from Mont St. Hilaire, Québec, Canada. Canadian Mineralogist, Vol. 8, pp. 506-514.

Narsarsukite is found in the eastern part of the hornfels collar surrounding the igneous pluton at Mont St. Hilaire. It is associated with albite, aegirine and neptunite. Narsarsukite forms short tabular prisms, approximately 3 mm in diameter and 1 mm long. It varies from yellowish-white on the periphery to greyish-white in the core.

Sabina, Anne P. 1983. Mont St. Hilaire Quarry. In Rocks and Minerals for the Collector. Geological Society of Canada (GSC) Miscellaneous Report 32, Ottawa, pp. 46-49.

Over 130 minerals have been identified from inside the veins and cavities of the nepheline syenite which forms the eastern half of Mont St. Hilaire; these include nine new species. The following is a list of the 130 minerals found, including nine new species, which are marked by an asterisk:

acmite, actinolite, albite, amphibole, analcine, anatase, ancylite, ankerite, antigorite, apatite, apophyllite, aragonite, arfevedsonite, arsenopyrite, ashcroftine, astrophyllite, augite, barylite, bastnaesite, behoite, biotite, birnessite, britholite, brookite, burbankite, calcite, cancrinite, carletonite*, catapleiite, chabazite, chalcopyrite, chlorite, cordylite, crocidolite, datolite, dawsonite, diopside, dolomite, donnayite*, ekanite, elpidite, epididymite, eudialite, ewaldite, fluorite, gaidonnayite*, galena, garnet, genthelvite, gibbsite, goethite, gotzenite, gmelinite, hackmanite, harmotome, hedenbergite, hematite, hilarite*, hiortdhalite, hydrotaleite, ilmenite, joaquinite, kaersutite, kainosite, kaolinite, karpinskyite, labuntsovite, lavenite, lemoynite*, leucophanite,

leucosphenite, limonite, loellingite, magnetite, marcasite, mcKelveyite, microcline, molybdenite, monteregianite*, muscovite, narsarsukite, natrolite, nenadkevichite, nepheline, neptunite, nordstrandite, parisite, pectolite, petarasite*, phillipsite, phlogopite, polylithionite, pyrite, pyrochlore, pyrophanite, pyrrhotite, quartz, raite, ramsayite, rhabdophane, rhodochrosite, richterite, rinkite, rutile, sanidine, scheclite, sepiolite, serandite, siderite, sodalite, sphalerite, steenstrupine, stillwellite, strontianite, synchisite, tetranatrolite*, thaumasite, thomsonite, thorite, titanite, tundrite, vesuvianite, villaumite, vinogradovite, willemite, wohlerite, wollastonite, wulfenite, wurtzite, yofortite*, zircon.

Stevenson, J.S., and L.S. Stevenson. 1977. Dawsonite-fluorite relationships at Montreal-area localities. Canadian Mineralogist 15: 117-120.

Specimens of dawsonite and fluorite were found crystallized together from Mont St. Hilaire, associated with the syenite breccia. In the syenite breccia, dawsonite-fluorite lines the walls of vugs which range from about 1 cm to 2 m in diameter. The formation of the dawsonite-fluorite is seen as a hydrothermal mineralization in vug fillings and in contraction fractures in the rocks; these hydrothermal solutions were apparently related to the alkalic igneous activity of the Mont St. Hilaire syenite.

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* **PEDOLOGY** *
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Gwyn, Quinten H. 1968. The role of moisture and temperature cycles in soil movement on Mont St. Hilaire, Québec. M.Sc. Thesis, Department of Geology, Montreal, Québec. 114 pages.

Two stations on the southeast slope and two stations on the south side were studied to measure vertical and down slope movement of soil. The southeastern slope has a concavo-convex profile, with an average gradient of 19°; depressions are moderately abundant (approximately 2 per 10 m^2). The southern slope has an average gradient of 14°, with only a few shallow depressions; surface drainage on the south slope is directly into Lac Hertel. Soil profiles are similar on all sites, are immature, and do not exceed 1.5 m. Horizon A ranges from 8 to 30 cm with moderate amounts of organic material; horizon B is thicker and is composed of mostly indigenous rather than transported material. The leaf litter ranges from 0-15 cm deep.

Soil creep measured at the soil surface averaged 0.9 cm/yr on slopes whose overall gradients ranged between 10° and 23°. The freeze-thaw cycle accounts for a minimum of 85% of soil movement on the mountain. Soil moisture changes resulting from processes other than soil freezing caused volume changes of less than 5%; this is primarily the result of the granular nature of the soils which lack expanding clay minerals. A positive correlation was found between the amount of vertical movement and the

moisture content of the soils immediately preceding ground freezing. An indistinct correlation was found between slope gradient and down slope movement. The aspect of the slopes appeared to have no effect on the magnitude of the processes active on them, but the aspect did affect the timing and duration of various processes.

Mallick, Khalil A. 1967. Weathering of rocks and mobility of elements in soil profiles of Mont St. Hilaire, Québec. M.Sc. Thesis, Department of Geology, McGill University, Montreal, Québec. 167 pages.

Soil profiles on various rock types of Mont St. Hilaire are mature, except in the igneous barrier area. The movement of soil in the A-horizon is faster than in the B-horizon of the same soil profile. The mean down slope movement in the soil profile is 23 cm per year. In general mineralogical and geochemical criteria both show that the soils are derived from the underlying rocks, except in areas underlain by limestone inclusion in the syenite area, the syenite-essexite contact zone and the hornfel areas where two or more soil types developed from different rocks were mixed. The soil profiles developed on igneous breccia and essexite appear to be contaminated by Champlain Sea sediments. The relative concentrations of Ti and Zr can be used to categorize the various types of rocks and soils, except for the hornfels and their derived soil profiles. In poorly drained areas, concentrations of Ca, Fe, Zn, K, and Mn in A-horizon are equal to or greater than the B-horizon of the same soil profile, but in well drained areas the converse is true. Differences in topographic conditions were not found to have any effects on the concentrations of mobile elements (Fe, Ca, Mn, Zn, K) in the soil horizons. Eudialite, orthoclase, plagioclase and quartz are good indicators for establishing correspondence between soil profiles and underlying rocks.

Pearce, Andrew. 1970. Post-glacial rates of some denudation processes, Mont St. Hilaire, Québec. M.Sc. Thesis, Department of Geology, McGill University, Montreal, Québec. 61 pages.

Rates of denudation due to soil creep and slopewash for the sites studied are in the order of 10-20 $m^3/km^2/yr$ (10-20 mm/1000 yr). Rates of denudation due to free face retreat for the sites studied are in the order of 20-40 $m^3/cm^3/yr$ (20-40 mm/1000 yr). Rates of fluvial denudation for the sites studied are in the order of 75-125 $m^3/km^2/yr$ (75-125 mm/1000 yrs). Rates of fluvial denudation are 2 to 10 times greater than rates of slope denudation at Mont St. Hilaire. The low rate of slope denudation compared to the rate of fluvial denudation is probably the factor which controls the overall denudation rate for Mont St. Hilaire. Fluvial denudation rates at Mont St. Hilaire are about one half of fluvial denudation rates in areas of similar relief and climate.

Pearce, Andrew, and John A. Elson. 1973. Postglacial rates of denudation by soil movement, free face retreat and fluvial erosion, Mont St. Hilaire, Québec. Canadian Journal Earth Science 10: 91-101.

Average rates of denudation over periods ranging from 11,800 years to 12,800 years at sites on Mont St. Hilaire were estimated as 13.0 ± 1.3 $m^3/km^2/yr$ and 17.7 ± 1.8 $m^3/km^2/yr$ for soil creep and slopewash; 40.2 ± 10.0 $m^3/km^2/yr$ and 18.4 ± 4.6 $m^3/km^2/yr$ for free face retreat, and 77.8 ± 7.8 $m^3/km^2/yr$ and 125.4 ± 12.5 $m^3/km^2/yr$ for fluvial denudation.

The rates of fluvial denudation at Mont St. Hilaire are lower by a factor of one-half than published short term fluvial denudation rates in areas of similar relief and climate. The rates of free face retreat at Mont St. Hilaire are similar to the lowest rates recorded in Spitsbergen, northern Sweden, and in the Yukon Territory.

Thomas, Robert D. 1974. The rates of denudation of Mont St. Hilaire, Québec. M.Sc. Thesis, Department of Geography, McGill University, Montreal, Québec. 164 pages.

Measurements of various denudation processes on Mont St. Hilaire determined soil creep as 1.52 cm/yr on an average slope of $\tan^{-1}$ 0.552; sheetwash as 0.12 g/cm/yr of sediment or 0.05 g/cm/yr of residue on an average slope of $\tan^{-1}$ 0.41; talus creep as 0.07 cm/yr on an average slope of $\tan^{-1}$ 0.50; tree throw as a maximum of 799 $cm^3/cm/yr$ on slopes less than $\tan^{-1}$ 0.15; and dissolution as 0.067 gm/l (annual value not available). Soil creep probably occurs on 80 percent of the slopes of Mont St. Hilaire. Sheetwash is significant only on about 25 percent of the slopes and talus creep occurs on less than 10 percent of the slopes. Tree throw may occur on up to 70 percent of the mountain, however, it was only recorded in abundance on less than 5 percent of the area. After converting the units and correcting for the estimated areas of activity of each process, the rates of denudation on Mont St. Hilaire as a whole are 12,160 $m^3/km^2/yr$ for soil creep, 200 $m^3/km^2/yr$ for sheetwash, and 70 $m^3/km^2/yr$ for talus creep.

Webber, G.R., and J.U. Jellema. 1965. Comparison of chemical composition of soils and bedrock of Mont St. Hilaire, Québec. Canadian Journal Earth Science 2: 44-58.

During pleistocene times, Mont St. Hilaire was glaciated, and most of the residual soil was removed. Some of the drift at the lower levels of the mountain has been reworked by the Champlain Sea, which partially covered the mountain up to about 170 m. The inner part of the mountain tested in this study is largely covered with overburden. The soil cover is thin except in the valleys; most of the soil appears to be of local derivation with most of the movement due to mechanical dispersion on slopes.

The elements in order of increasing tendency to be depleted in the soil relative to parent rock are Fe 1.25, Nb 1.11, Ca 1.08, Rb 1.07, Zn 1.02, Zr

0.96, Ti 0.94, Mn 0.82, Sr 0.69, and K 0.54. The trend appears to be an enrichment of Fe and a loss of K, Sr, and probably Mn in the soil compared with the parent rock. The changes in the other elements are not large, if there has been any significant change at all. There may be a tendency to lose Ca from soils derived from syenitic rocks, and a tendency to accumulate it in soils derived from essexitic rocks.

The areal distribution of elements in the soils on Mont St. Hilaire is in general agreement with what is known of the distribution of the syenitic and essexitic intrusive rocks which make up the mountain. Elements occurring in greatest abundance in the western, essexite-underlain half of the mountain, are Ca, Sr, Fe, and T: the elements K, Mn, Zn, Rb, Nb, and Zr occur in greatest concentration in the eastern, syenitic half of the mountain. However, high concentrations of elements having greater affinity for the essexitic rocks extend into the central part of the eastern half of the mountain, thus there might be a corresponding extension of the essexites in this area.

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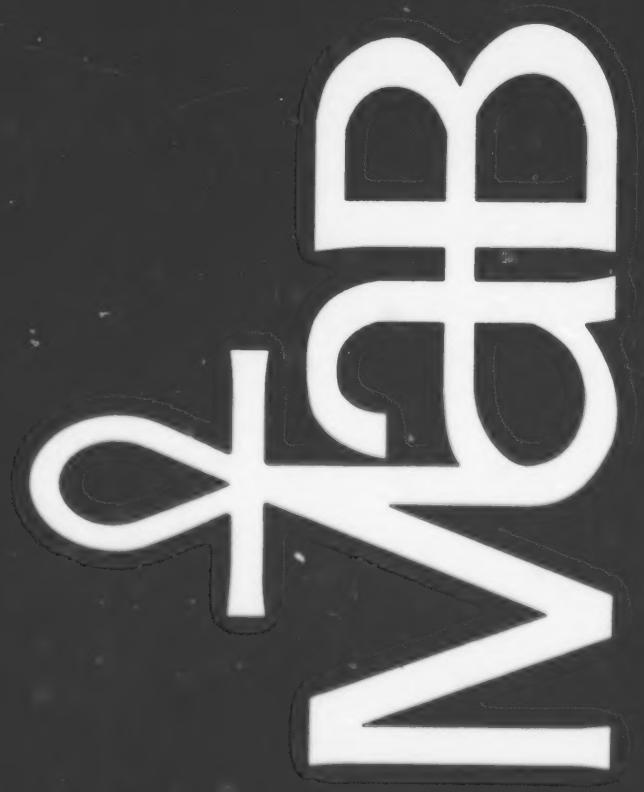

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RAPPORT N° 18

BIBLIOGRAPHIE ANNOTÉE DES RECHERCHES EFFECTUÉES AU MONT ST-HILAIRE (QUÉBEC)

préparée par

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Vues du Mont St-Hilaire

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Préface

Le Mont St-Hilaire, l'une des collines montérégiennes qui longent la rivière Richelieu, au sud et à l'est de Montréal, constitue un excellent site de recherches sur le terrain près du campus de l'Université McGill à Montréal. Plus de 930 hectares, comprenant tout le bassin du lac Hertel et une bonne partie des flancs externes de la montagne, sont protégés comme Réserve de la biosphère de l'Unesco et sont gérés par le conseil du Domaine Gault de l'Université McGill. Le bâtiment du Centre de recherches comprend un laboratoire de chimie en milieu humide, tout l'espace voulu pour le traitement des échantillons, des bureaux et une salle de conférence, ainsi qu'un terminal relié à l'ordinateur central de l'Université. Des dortoirs confortables permettent aux chercheurs de demeurer provisoirement sur place. Au cours des années, de nombreux chercheurs de McGill et d'autres universités ont mené à bonne fin des projets de recherche sur la montagne et la documentation abondante sur l'histoire naturelle de la montagne facilitera la planification des futures recherches. L'objet de cette bibliographie annotée est de fournir un résumé facile à consulter des recherches déjà effectuées au Mont St-Hilaire.

Nous avons parfois inclus dans nos annotations des données que les utilisateurs préféreraient voir éliminées, par exemple la liste des 130 minéraux identifiés sur le Mont St-Hilaire ou les analyses détaillées du sol trouvées à Beaumont (1980). La liste des minéraux est un résumé concis que trouvent utile les naturalistes du Centre de conservation du Mont St-Hilaire et qui incite les minéralogistes de l'est de l'Amérique du Nord à venir au Mont St-Hilaire et peut-être même à y travailler. De même, les données provenant de Beaumont représentent le seul résumé disponible des caractéristiques du sol de la montagne, et elles ne figurent malheureusement dans aucune publication de diffusion générale. Ceux qui s'intéressent au sol forestier et aux effets de la pluie acide peuvent utiliser ces tableaux pour évaluer immédiatement la possibilité d'utiliser le Mont St-Hilaire comme un site d'étude. En général, nous avons cherché à inclure quelques-unes de ces données détaillées dans la bibliographie, de sorte qu'il ne s'agit pas seulement d'un résumé de ce qui a été fait, mais également, jusqu'à un certain point, de ce qui a été trouvé.

Cette bibliographie n'aurait pu être compilée sans les diligents efforts de M. Adrian Levy, qui a effectué les recherches en bibliothèque et rédigé les résumés. M. George Francis, président du Groupe de travail sur les réserves de la biosphère du MAB/Canada, a également joué un rôle essentiel en obtenant l'argent pour les salaires, les fournitures et les frais de publication. Cathy Hughes, Egidia De Michele et Janet Zohorsky ont patiemment dactylographié et redactylographié les nombreuses versions de la bibliographie.

La présente bibliographie est, à notre connaissance, complète jusqu'à 1985. Malgré tout, certains travaux antérieurs ont pu avoir été omis. Je serais heureux d'être avisé de ces travaux et de toute erreur qui aurait pu se glisser dans les résumés. Nous espérons que des données plus complètes

sur les travaux antérieurs, et les publications concernant les projets en cours et futurs nous permettront de publier un supplément à cette bibliographie d'ici quelques années.

Je m'efforcerai en outre de fournir toute autre information utile sur le Mont St-Hilaire aux chercheurs futurs. Cette bibliographie fait ressortir les possibilités de la réserve du Domaine Gault pour la recherche, et j'espère que d'autres projets viendront sous peu compléter nos connaissances à ce sujet.

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Introduction

A son décès, à l'automne de 1958, Andrew Hamilton Gault a légué la montagne de St-Hilaire à l'Université McGill. Avant que Gault en fasse l'acquisition, en 1912, le domaine servait surtout de centre touristique, et quelques études préliminaires seulement avaient été faites sur les origines géologiques du district. Ce n'est que lorsque la gestion du Domaine Gault est passée à l'Université McGill que commencèrent les recherches scientifiques sérieuses. Depuis vingt-cinq ans, le Mont St-Hilaire a fait l'objet d'une cinquantaine de thèses universitaires et de plus de 150 publications dans des revues savantes; il s'agit d'une contribution considérable à la connaissance de la montagne, des collines montérégiennes et du biome de la forêt de feuillus de l'Est.

Le Mont St-Hilaire a été mentionné pour la première fois en 1860 dans la littérature scientifique. Rédigé par Sterry Hunt, l'article portait sur les roches ignées de la montagne. Au début du 20e siècle, Frank Dawson Adams a déterminé que le Mont St-Hilaire faisait partie des collines montérégiennes (de Mons = mont, et Regius = royal). En 1959, des professeurs de McGill ont effectué un relevé scientifique pour évaluer les possibilités de recherche du Domaine Gault. Faisaient partie de ce relevé des listes détaillées de la flore et de la faune de la montagne, qui ont servi de base à des recherches subséquentes en botanique, zoologie, limnologie et écologie. Des recherches en géologie, minéralogie, pédologie, hydrologie, météorologie et palynologie ont été entreprises à la même époque.

Les 13 chapitres de la bibliographie représentent les principaux secteurs des recherches déjà effectuées sur la montagne. Nous nous sommes efforcés de dresser une liste complète des recherches sur le Mont St-Hilaire, y compris des travaux faits dans d'autres universités que McGill. Bien que bon nombre des références se retrouvent dans deux catégories ou plus, elles figurent néanmoins sous l'objet principal de la recherche.

Les résumés comprennent des informations pertinentes dans le cas du Mont St-Hilaire; sont incluses, par exemple, des données indiquant la nature représentative ou le caractère unique de la montagne. Les résumés ont été tirés de précis, de sommaires rédigés par les auteurs, ou de thèses ou articles. Tous les ouvrages mentionnés ont été lus. Les données qui semblent contradictoires, par exemple sur la profondeur maximale du lac Hertel, sont reproduites telles qu'elles figurent dans chacune des sources citées. Nous avons également utilisé les noms scientifiques cités dans la source, sans chercher à corriger la nomenclature. Bien que nous nous soyons efforcés de résumer chaque ouvrage avec exactitude, nous recommandons fortement aux chercheurs qui utilisent cette bibliographie de consulter les documents eux-mêmes pour toute donnée d'importance critique.

Nous avons inclus une carte topographique de la montagne et une carte de la géologie sous-jacente, pour aider le lecteur à situer les endroits

mentionnés dans la bibliographie. Deux cartes de la géologie sous-jacente et superficielle des Basses-Terres avoisinantes du St-Laurent sont également fournies, ainsi qu'une série de cinq cartes illustrant l'histoire de la colonisation européenne de la région immédiate de la montagne, depuis les premiers colons qui se sont établis sur les rives du Richelieu en 1671.

En 1960, le gouvernement canadien a fait du Mont St-Hilaire un refuge fédéral d'oiseaux migrateurs, pour protéger les 175 espèces ou plus d'oiseaux qui y nichent. En 1978, l'Unesco désignait la montagne comme première réserve de la biosphère du Canada. Ces réserves ont pour objet de représenter les grands systèmes écologiques du monde, ainsi que l'histoire de leur utilisation et adaptation par l'homme. Cette désignation fait ressortir l'utilité du Mont St-Hilaire comme zone naturelle et centre de recherche. Les caractéristiques uniques de la montagne, y compris la riche diversité de ses minéraux, de sa flore et de sa faune, créent un ensemble qui est plus grand que la somme de ses parties. Le fait que ce caractère unique ait été, et continue à être, étudié et reconnu, répond au désir d'Andrew Hamilton Gault, notamment, que le Mont St-Hilaire soit préservé pour "assurer à la jeunesse du Canada la jouissance perpétuelle de ce domaine."

NOTE EXPLICATIVE

La version anglaise de la Bibliographie annotée des recherches effectuées au Mont St-Hilaire (Québec) n'a pas été traduite en français, seules la préface et l'introduction l'ont été. Nous vous prions de vous référer à la version anglaise pour la bibliographie elle-même.